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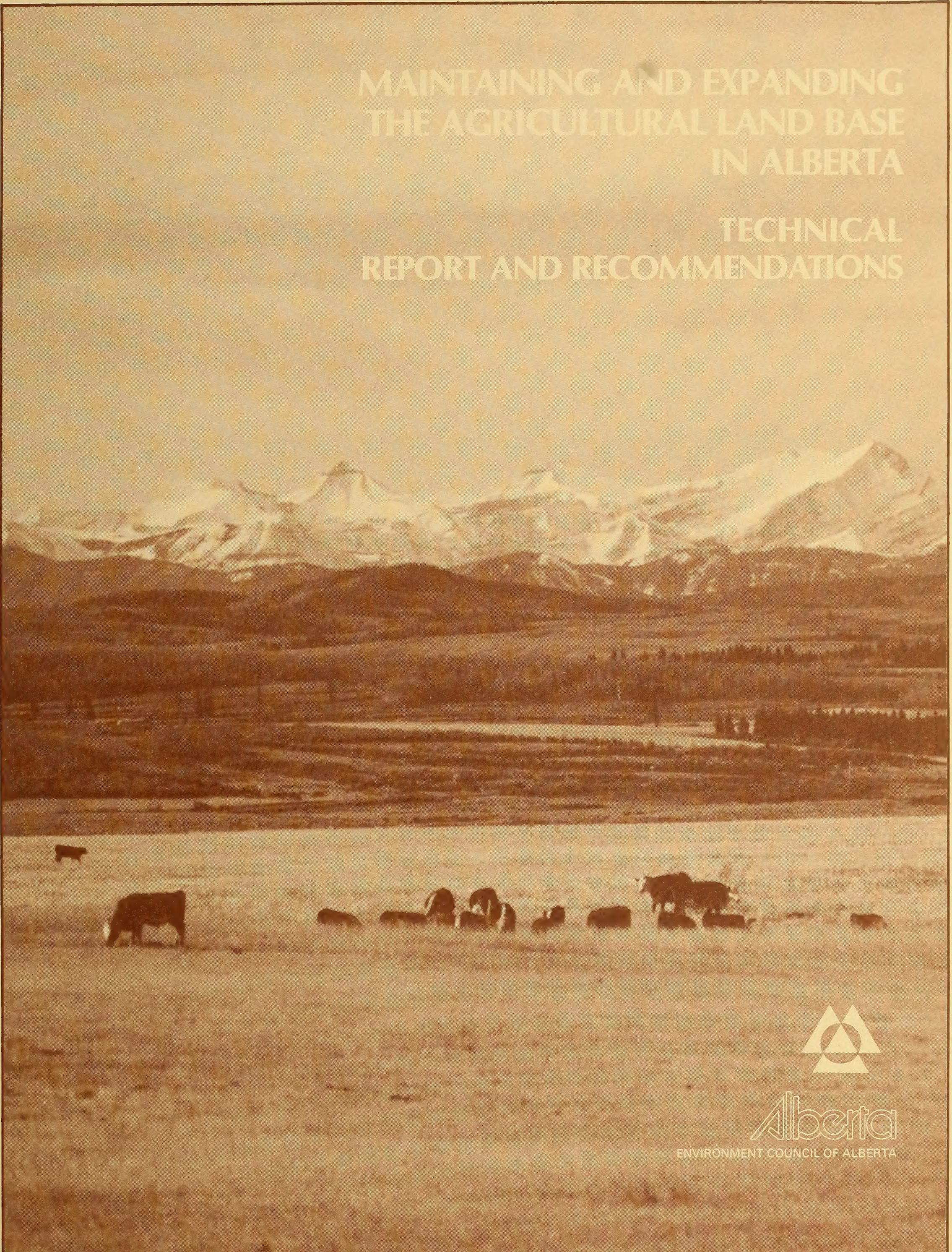

MAINTAINING AND EXPANDING THE AGRICULTURAL LAND BASE IN ALBERTA

TECHNICAL REPORT AND RECOMMENDATIONS

Alberta
ENVIRONMENT COUNCIL OF ALBERTA

DDN 5466801

Maintaining and Expanding the Agricultural Land Base in Alberta

Technical Report and Recommendations

MARCH 1985

ENVIRONMENT COUNCIL OF ALBERTA

Copies of this
report may be obtained
upon request to

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ECA85-17/RR2

Lieutenant-Governor in Council
Legislature Building
EDMONTON, Alberta

Honourable F.D. Bradley
Minister
Department of the Environment
132 Legislature Building
EDMONTON, Alberta
T5K 2B6

Dear Sirs:

I have the honour to transmit, herewith, the Report and Recommendations of the Environment Council of Alberta on Maintaining and Expanding the Agricultural Land Base in Alberta, as required under Section 7 (1) (i) of the Environment Council Act (Chapter E-13 R.S.A. 1980).

I have the honour to be, Sirs,

Your obedient servant,

Chas Stewart

Charles Stewart
Chairman, Agricultural Land Base Panel
Environment Council of Alberta

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Contents

Summary of Recommendations ix

1 Introduction 1

1.1 Terms of Reference 3
1.2 Information Program 4
1.3 Public Hearings 4
1.4 Perspectives 5

2 Agriculture in Alberta 9

2.1 International Markets 11
2.1.1 Wheat 11
2.1.2 Coarse Grains 12
2.1.3 Oilseeds 14
2.1.4 Long-Term Grain Markets 17
2.1.4.1 Subsidies 19
2.1.4.2 Forecasts 20
2.1.5 Long-Term Oilseed Markets 22
2.1.6 Domestic Consumption of Grains and Oilseeds 23
2.1.7 Alberta's Share of Markets in 2010 24
2.1.8 International Food Aid 26
2.2 Yields 28
2.3 Specialty Crops 34
2.4 Marketing Boards 37
2.5 Red Meat Markets 39
2.5.1 Cattle 39
2.5.2 Pork 42
2.5.3 Lamb and Mutton 43
2.6 Discussion 44
2.7 Institutions 48
2.7.1 Complexity of the Institutional Framework 50
2.7.2 Discussion 55

3 Maintaining the Agricultural Land Base 59

3.1 Private Land Use in Alberta 62
3.1.1 Urban Growth and Rural Subdivision 62
3.1.2 Linear Developments 77
3.1.3 Industrial Uses 79
3.1.4 Resource Extraction 82
3.1.5 Agriculture and the Rural Environment 88
3.2 Public Land 95
3.2.1 Agriculture on Public Land 98
3.2.2 Access and Multiple Use 102
3.2.3 Energy Dispositions 104

3.2.4 Forestry Dispositions 105
3.2.5 Integrated Resource Plans 105
3.3 Factors Affecting Production and Conservation 107
3.3.1 Erosion 113
3.3.2 Organic Matter and Nutrient Loss 115
3.3.3 Dryland Salinity 115
3.3.4 Agricultural Chemicals 117
3.3.5 Acidification 118
3.3.6 Synthesis 119

4 Northern Expansion of the Agricultural Land Base 125
4.1 Climate 127
4.2 Soils 127
4.3 Production 129
4.4 Economics of Farming 130
4.5 Government Expenditures 132
4.6 Environmental Considerations 133
4.7 Land Allocation Procedures 134
4.8 Conclusion 135

5 Maximization of the Agricultural Land Base 137
5.1 Land Improvements 139
5.1.1 Reduction of Summerfallow 144
5.1.2 Solonetzic Soils 145
5.1.3 Acid Soils and Liming 146
5.1.4 Drainage 147
5.2 Intensification 148
5.2.1 Intensive Livestock Operations 148
5.2.2 Greenhouses and Market Gardens 149
5.2.3 Irrigation 153
5.3 Economics and the Further Maximization of Agricultural Land Use 156
5.4 Research and Technology Transfer 158
5.4.1 Areas for Research 160
5.4.2 Funding of Agricultural Research 164
5.4.3 Impediments to Technology Transfer 165

6 Conclusion 167

References 173

Appendices 179

Appendix A. Agricultural Land Base Publications 181
Appendix B. Hearing Locations and Participants 182
Appendix C. Legislation Administered by Agriculture Canada 191
Appendix D. Federal Programs Affecting Agriculture 193
Appendix E. Provincial Legislation Affecting Agriculture 196

Tables

1. World wheat exports (July – June crop year) 12
2. World coarse grain exports (July – June crop year) 13
3. Yields of flaxseed 15
4. Exports of canola/rapeseed 15
5. Yields of rapeseed 16
6. Rapeseed/canola ending stocks 16
7. Stocks of rapeseed/canola on farms as of July 31 17
8. Measures of agricultural intensity 18
9. Targets for 1990 Canadian export levels 20
10. Comparison of world wheat export levels and shares in 1982-83 and in 2010 21
11. Comparison of world coarse grains export levels and shares in 1982-83 and in 2010 22
12. Canadian flaxseed exports 23
13. Total production from the Prairie Provinces and percent of production in Alberta 25
14. Commercial import and food aid grain for developing countries 27
15. Changes in per capita income of developing countries 27
16. Yields for tame hay, wheat, oats, barley, and rapeseed/canola on fallow and stubble in Alberta 29
17. Acreage in specialty crops, 1981 35
18. Specialty crops: a comparison of Alberta and Manitoba 36
19. Different types of marketing boards 38
20. Canadian imports and exports of beef 40
21. The relationship between estimated pork consumption and hog production in western Canada 43
22. Forecast of Canadian grain and oilseed exports for 2010 44
23. Forecast of domestic consumption of grains and oilseeds for 2010 44
24. Forecast of total market for grains and oilseeds in 2010 44
25. Alberta's share of forecast market for grains and oilseeds in 2010 45
26. Production compared with forecast markets for Alberta grains and oilseeds 45
27. Forecasts of acreage required for grains and oilseeds 46
28. Federal government expenditures on agricultural programs 51
29. Provincial departments responsible for legislation affecting the agricultural land base 51
30. Regulations and amendments to major agricultural legislation (Alberta Agriculture) 52
31. Regulations and amendments to major agricultural legislation (other departments) 52
32. Provincial budget allocations for agricultural programs 53
33. Total area of Alberta classified by tenure, 1984 96
34. Agricultural dispositions on public lands 100
35. Average yield of wheat, oats, and barley in different agro-climatic areas of Alberta 129
36. Crop production in northern Alberta compared with the province as a whole 131

37. Acreage added to Alberta's farmland 139
38. Unimproved farmland as a percentage of total occupied farmland in Alberta 140
39. Total occupied farmland in Alberta 140
40. Summary of agricultural land base changes in Alberta 1976-80 141
41. Land base changes by CLI classes, Alberta 1976-80 141
42. Percentage of CLI classes in cultivation in Alberta 142
43. Productivity indices for CLI classes for the Prairie provinces 142
44. Extent of acidic soils 146

Figures

1. Yields for tame hay, wheat, oats, barley and rapeseed/canola on fallow and stubble in Alberta 30
2. Farmland assessment form 74
3. Integrated resource planning projects 106
4. Agro-climatic areas of Alberta 128

Summary of Recommendations

Section 2.7.3 **Recommendation 1**

That an Agricultural Resources Conservation Board be established, reporting to the Minister of Agriculture and charged with responsibility on behalf of the Government of Alberta for the conservation, maintenance, and enhancement of the agricultural land base.

Section 2.7.3 **Recommendation 2**

That the responsibility for the maintenance of the agricultural land base rest with the rural municipalities of Alberta. The responsibility to protect the agricultural land base should be accompanied by the power and authority necessary to achieve this objective.

Section 3.1.1 **Recommendation 3**

In the identification of the appropriate growth options for major roads, utilities, and the expansion through annexation of residential, commercial, and industrial developments, the regional planning commissions should develop benefit/cost analyses of the alternatives that consider not only the cost to the urban centers but the costs to the economy as a whole of the various alternatives for development.

Section 3.1.1 **Recommendation 4**

That the location of feedlots and intensive agricultural operations be a matter of municipal control under land use bylaws.

Section 3.1.1 **Recommendation 5**

The agricultural production lost when land is removed from agriculture should be replaced either by support of agricultural research and development or by practices and programs which would permanently replace the lost production.

Section 3.1.1 **Recommendation 6**

Future additional country residential lots can be accommodated with a minimal impact on the agricultural land base, if the suggested guidelines are followed.

Section 3.1.1 **Recommendation 7**

Municipalities should be urged to collect information on the cost of providing services to various types of uses in different areas of the municipality relating to different levels of existing and proposed infrastructure.

Section 3.3.6 **Recommendation 8**

That an agricultural land use classification be developed that identifies the ability of the soil to be continuously utilized for different types of agriculture without major degradation.

Section 3.3.6 **Recommendation 9**

That there be provision for the establishment of "Soil Reclamation Districts" whereby two-thirds of the landowners within defined boundaries may determine the remedies necessary to arrest soil degradation and/or reclaim lands presently subject to degradation. Within Soil Reclamation Districts, constant dollar or low-interest loan funding should be available to help carry out remedial measures, with repayment to be compatible with benefits derived.

Section 3.1.5 **Recommendation 10**

That the Planning Act and Regulations be amended to provide for the implementation of rural replotting schemes.

Section 3.3.6 **Recommendation 11**

This Panel supports the recommendation in the report on soil conservation by the Standing Committee on Agriculture, Fisheries, and Forestry, to the Senate of Canada, reading

That the Canadian Wheat Board modify the quota system to extend (a) full quota entitlement, at the "bonused" level of seeded acreage, to those remnant farmlands considered of marginal value for agriculture; and (b) partial quota entitlement, equivalent to current quota levels for summerfallow, to extensive tracts of unimproved pastureland which form integral parts of farm units.

Section 3.3.6 **Recommendation 12**

The Panel believes that the method of calculating coverage and payouts should be neutral as between planting on summerfallow or stubble. Since there are many technical details and complications in achieving this objective, the Panel calls on the Canada — Alberta Crop Insurance Corporation to give this matter their urgent consideration.

Section 3.3.6 **Recommendation 13**

An agricultural development permit, issued by the Agricultural Service Board, should be required to clear or break land. Permits could identify special conditions under which clearing or breaking should take place.

Section 3.1.4

Recommendation 14

That the rural municipality be given the responsibility for reclamation not dealt with under the Land Surface Conservation and Reclamation Act's regulated surface disturbances provisions. This proposal is not intended to replace direct negotiation between the applicant and the landowner for right of entry.

Section 2.6

Recommendation 15

That the Government of Alberta work toward the removal of all inter-governmental barriers to free trade in beef, whether at the feeder cattle or finished stage. Particular attention should be paid to indirect barriers, including excessive levels of subsidy to develop beef cattle industries.

If, after fully canvassing the potential for free trade in beef at the provincial, national, and international level, the conclusion on potential expansion is negative, the Government of Alberta should institute special beef marketing programs. These might include special transportation assistance to market beef in new market areas, additional research on new forms of beef products, packaging, processing, transportation, and storage, and continuing follow-up and reassessment of existing programs and initiatives.

Section 2.6

Recommendation 16

Export marketing of grass and forage products should involve product-oriented task groups representing each element in the chain from producer to consumer.

Section 5.4.1

Recommendation 17

That research be carried out to provide more information on the maintenance of and amendments to Alberta agricultural soils.

Section 3.3,
Section 5.4.1

Recommendation 18

That a research fund be established to study soil reclamation and effects of industry on agriculture. This fund could be developed by contributions from industry, matched by government.

Section 3.3,
Section 5.4.1

Recommendation 19

Research should be carried out on an ongoing basis to study the long-term effects of agricultural chemicals on soils.

Section 5.4.2 **Recommendation 20**

More funding for production research should be provided, and there should be a closer liaison between provincial and federal research institutions. Producers should be encouraged to contribute to research funding through a levy on sales of production.

Section 5.4.1 **Recommendation 21**

That more research into grass and forage production be carried out, particularly into methods of increasing yields per acre.

Section 5.4.3 **Recommendation 22**

That Agricultural Service Boards be encouraged to act as a practical research liaison within their jurisdiction in determining local research needs and in planning and managing projects.

Section 5.3 **Recommendation 23**

That a research project be instituted to identify the full range of benefits and costs of various government incentive and subsidy programs on the sectors of the agricultural economy that they were intended to assist, as well as on other parts of agriculture and the larger economy.

Section 5.3 **Recommendation 24**

Provincial programs of expansion and intensification should be assessed and priorized on the basis of the following guidelines.

Section 4.8 **Recommendation 25**

That northern agricultural land base expansion be limited to the fringes of existing agricultural settlements until more is known about potential expansion areas.

Section 3.2.2 **Recommendation 26**

Range Management Agreements should have a 20-year term renewable in the tenth year. Any increment of grazing capacity that was due to good management by the lessee, or range improvements carried out at the lessee's cost, should accrue to the lessee, even if this were to exceed the existing 600 animal unit limitation on size.

Section 3.2.2 **Recommendation 27**

Grazing reserve expansion should be restricted to those cases where a grazing association indicates its willingness to undertake all costs of maintenance and operation. The responsibility for maintenance and operation of existing reserves should be turned over to local grazing associations as quickly as possible.

Section 3.1.1 **Recommendation 28**

That all land and buildings used for primary food production that are annexed to an urban municipality be treated for assessment purposes as though they had remained in the rural municipal jurisdiction, accompanied by municipal service levels similar to those of the rural municipality, until these lands are converted to a use other than agriculture.

Section 5.2.2 **Recommendation 29**

That greenhouse buildings and land be assessed as agricultural for municipal tax purposes.

Note: The recommendations are numbered to reflect their order of appearance in the companion summary to this report, entitled *Maintaining and Expanding the Agricultural Land Base in Alberta: Summary Report and Recommendations.*

This report is based to a large degree on the comments made by Albertans to the Panel at the public hearings. Throughout the report, the numbers of the briefs which contributed to the Panel's ideas appear in parentheses in the appropriate locations. A complete listing of the briefs presented is given in Appendix B.

The Panel also found some information from other sources invaluable in the preparation of the report. Statistics in both the metric and imperial measuring systems appeared in these sources, and for the convenience of readers who wish to convert from one system to the other where this has not been done in the text of the report, the following conversion factors are offered.

1 inch (in) = 2.54 centimeters
1 centimeter (cm) = 0.394 inches
1 mile (mi) = 1.609 kilometers
1 kilometer (km) = 0.621 miles
1 acre (ac) = 0.405 hectares
1 hectare (ha) = 2.471 acres
1 pound (lb) = 0.454 kilograms
1 kilogram (kg) = 2.205 pounds
1 ton (2000 lbs) = 907.185 kilograms = 0.907 tonnes
1 tonne (t) = 1.102 ton

Wheat
1 bushel (bu) = 60 pounds or 27.216 kilograms or 0.027 tonnes
1 kilogram = 0.037 bushels

Oats
1 bushel = 34 pounds or 15.422 kilograms or 0.015 tonnes
1 kilogram = 0.065 bushels

Barley
1 bushel = 48 pounds or 21.772 kilograms or 0.022 tonnes
1 kilogram = 0.046 bushels

Rye, Flaxseed
1 bushel = 56 pounds or 25.401 kilograms or 0.025 tonnes
1 kilogram = 0.039 bushels

Rapeseed
1 bushel = 50 pounds or 22.680 kilograms or 0.023 tonnes
1 kilogram = 0.044 bushels

CHAPTER 1

INTRODUCTION

1.1 Terms of Reference

On February 10, 1982 the Environment Council of Alberta received Order in Council 158/82. This asked the Council to enquire into means for maintaining and expanding the Alberta agricultural land base and for maintaining its production. The enquiry was to address issues related to:

a) identification of concerns, possible causes, and recommendations in respect to problems of soil erosion and salinization;

b) potential productivity opportunities based on agricultural research in both livestock and other agricultural production;

c) the use of greenhouse production including potential capacity and identification of suitable geographic areas;

d) the potential effect of urban growth, industrial development, and the land requirements of pipelines, power lines, roads, and airports on our agricultural land base;

e) the use of fertilizers and chemicals and procedures used in summerfallowing and soil banking in relation to the efficiency of current and proposed agricultural practices.

The Council was also asked to hold public hearings on the topic and to prepare a report for the Lieutenant-Governor in Council and the Minister of the Environment.

A later Order in Council (247/83; March 23, 1983) created the panel responsible for this task. The members are:

Charles Stewart — Chairman

A former MLA for Wainwright, and retired agribusinessman, with an extensive background in managing feedlots, ranching, and livestock marketing.

Alistair Crerar — Vice-Chairman

An economist-planner, and Chief Executive Officer of the Environment Council, who has been Vice-Chairman of four previous ECA public hearing panels.

Walter Van De Walle — Member

An active farmer from Legal with extensive experience in grain, oilseed, and forage marketing, as well as in local government, farm organizations, and agribusiness.

James A. Lore — Member

A professional agrologist, a farmer in the Carstairs area, and an agricultural consultant with offices in Calgary, whose professional specialization includes land appraisal and land use planning as it affects agriculture.

George C. Walker — Member

A professional engineer and land surveyor with extensive experience in land development throughout the province as a partner in an Edmonton-based engineering firm, as a consultant, and as a director or executive member (including chairmanships) of HUDAC-Edmonton and the Urban Development Institute.

1.2 Information Program

Prior to the public hearings an extensive public information program was carried out. The objective of the program was to announce the hearings and to provide background information on the topic. That information consisted of: 15 technical reports, 16 summary reports (see Appendix A), a brochure, and a film, *Tomorrow's Bread.* This information was intended to be an objective source of background material on the agricultural land base, with a minimum expression of opinions and conclusions.

The information program resulted in the distribution of about 61,000 reports and 40,000 brochures. Major aspects of the program were:

a) 85 public meetings

b) creation and utilization of a mailing list

c) assistance from 4-H clubs in distributing hearing announcement posters

d) displays in urban and rural areas

e) press releases on the various reports

f) press conferences by Panel members

g) local media announcements about the hearings.

1.3 Public Hearings

The hearings were held at 17 locations, totalling 25 days. They began on July 28, 1983 in Fort Vermilion and concluded in Edmonton on December 15, 1983. Hearing locations and timing included several considerations, such as:

a) The overall intention was to ensure that all sectors would be within reasonable driving distance of a hearing location, preferably at a time of lower work load.

b) The Fort Vermilion hearing was held in the summer as many area residents would have been employed off farm at the time scheduled for the other hearings.

c) Since agricultural land concerns affect food and shelter, and services and industrial employment, they involve urban populations. Hence hearings were held in the urban centers.

d) At all locations an evening session was held in order to accommodate those who could not participate during the day.

e) Public demand necessitated an extra day of hearings in Red Deer and three extra days in Edmonton.

Appendix B presents a listing of the hearing locations and participants. Some briefs were received after the hearings and were also considered in the preparation of this report. The 276 presentations represented a wide range of Alberta society. The breakdown is as follows:

Group	**Number**	**Percent**
Personal	102	37.0
Agricultural	52	18.8
Municipal Government	40	14.5
Environmental	13	4.7
Professional	13	4.7
Community	12	4.3
Industrial	10	3.6
Regional Planning Commissions	10	3.6
Other	9	3.3
Recreation	6	2.2
Education	4	1.4
Developers	2	0.7
Federal Government	2	0.7
Provincial Government	1	0.4
Total	276	

The 276 briefs to the Panel, and the questions asked and answered in conjunction with the 260 presented at the hearings, were all subjected to detailed content analysis. About 8,000 records were created and an extensive computer-assisted coding system was used to facilitate information retrieval at the report preparation stage. Those records are available for viewing at the Council's library in Edmonton.

In addition to the above, the Panel met with provincial and federal government agencies after the hearings. Panel members also attended several relevant conferences and seminars.

1.4 Perspectives

The public hearings gave the Panel an opportunity to hear a variety of perspectives on the security of our agricultural land base. Many people acknowledged that it could be difficult to arouse general concern about this matter because of the apparent abundance of farmland in this province. In most of southern and central Alberta, crops and grazing land dominate the landscape and seem to go on forever. People take the existence of agriculture for granted, which is not surprising since farming has been part of the Alberta way of life since the province was settled; even urbanites probably harbor some romantic notions of the rural life style. Agriculture is an integral part of the social and economic fabric of Alberta.

However, there is growing evidence that all is not well in the agricultural industry. Land prices have escalated rapidly in the last decade, forcing many farmers who want to expand or those individuals who wish to begin farming to assume heavy debt loads; input costs have also risen significantly while commodity prices have not kept pace; finally, there are indications that the land base itself is in jeopardy with land being removed from crop production by competing uses and as a result of deteriorating soil quality. Concern about the loss of agricultural land has been expressed in the scientific literature and in the media, while other recent events such as the famine in Africa or, closer to home, last year's drought on the Prairies, have given many North Americans an increased awareness of the value and the vulnerability of our food-producing lands.

Clearly, both the quality and the quantity of our agricultural land base are important. These two aspects become linked when the amount of land suitable for agriculture in Alberta is considered. Only 17 percent of Alberta's land base is classed as prime agricultural land (Canada Land Inventory Classes 1 to 3), while another 15 percent is considered marginal for cultivation (CLI Class 4); this translates to 27.9 million acres and 24.5 million acres respectively. The same features which made an area suitable for agriculture during settlement later appealed to those involved in the planning and development of towns. As these towns and villages grew, it was inevitable that expansion onto good land would occur. Consequently, those rural areas adjacent to population centers have generally experienced the most pressure from non-agricultural uses.

Also, better soils yield greater returns for the same inputs and although additional land may be available on an acre-for-acre basis to replace land which is removed from agricultural production, it is generally of poorer quality. Therefore it cannot replace the productivity of good land which has been degraded or taken for other uses. Prudence suggests that the inherent economic advantage of keeping our best soils in agriculture should not be squandered.

Alberta's agricultural industry has been very successful in competing in the global marketplace, and there is the opportunity to maintain and improve our position into the next century. Meeting this challenge and responding to the demands for our agricultural products will require foresight and co-operation, and one of the critical components will be the maintenance and expansion of our agricultural land base, the topic of this investigation and the associated public hearings.

During the public hearings there was considerable support for the conservation of the agricultural land base, for the reasons given above and others. Where the dispute arose was over the degree of protection that the agricultural land base deserved: whether it should be preserved under almost any circumstances against almost any alternative uses, or whether it should only prevail against a few uses. The Panel has chosen the following criteria to guide it in the appropriate degree of protection warranted, or expansion supported.

The agricultural land base warrants protection:

1) as the essential support to a major Alberta industry, one capable of substantial and sustained expansion;
2) to provide for an internationally competitive agricultural sector capable of sustained commercial viability;
3) as a major land user capable of accommodating and enhancing other uses while respecting its own needs.

CHAPTER 2

AGRICULTURE IN ALBERTA

2.1 International Markets

Markets are both peripheral and central to the question of the maintenance and expansion of the agricultural land base — peripheral because the public hearings did not deal directly with markets and marketing, focusing instead on the many aspects of land use; central because the bottom line of food production is the demand of someone, somewhere for a product at a price that covers the cost of production, transportation, preparation, packaging, and distribution, with sufficient profits to induce each element of the food chain to perform its function.

There has been an astounding expansion in world markets for grain in the last 25 years. Wheat and coarse grain exports worldwide have expanded from about 58 million tonnes in the 1957-61 period to about 195 million tonnes in the 1980-84 period, a more than threefold increase, or a compound growth rate of about 5 percent per annum.

Extrapolation of past trends into the future is the simplest and easiest way of forecasting. It is probably the most inaccurate as well. The conditions that existed during the last 25 years are not likely to be repeated. On the demand side was the entry of the USSR and China on the market as major grain customers; on the supply side were the grain surpluses generated by the European Economic Community (EEC) and the ability of the USA to expand supply for coarse grains, particularly corn.

2.1.1 Wheat

Canada has maintained a reasonably steady proportion of world wheat exports. However, we have not increased our share of the world wheat export trade, as have the US, and most spectacularly, the EEC. At the same time we have not experienced the loss of market share experienced by "Others", a number of small exporting nations that collectively were an important segment of the trade in the '50s. (See Table 1.)

What has occurred in the world's export wheat trade is that it has become increasingly concentrated in a few countries. The USA, Canada, and the EEC account for over 80 percent of the world's wheat export trade. The EEC and Canada shared almost equally in the 1982-83 crop year with about 20 percent of the trade apiece, while the USA accounted for just over 40 percent.

When it is remembered that the EEC is not a natural grain surplus producing area, but is only able to export to the extent that it does through massive continuing subsidies, the precarious nature of the world's wheat export situation is emphasized. Since the role of the EEC as a major wheat exporter is a political decision, involving a substantial expenditure of government funds, it can be changed very quickly, particularly in a downward direction. For the EEC to continue an expansion in volume and export market share would require a rising level of price subsidy and a continuation of the high level of support for agricultural research practiced by EEC countries. (Western Europe accounts for 52.8 percent of the world's government-supported agricultural research [Anderson 1983]). Neither of these actions is impossible; indeed, they have occurred with each new EEC budget. However, each budget has had to face rising opposition and greater difficulty of passage. In the early '70s Common Agricultural Policy (CAP) budgets were passed quickly with arguments centering

Table 1. World wheat exports (July — June crop year)

Exporter	1958-59		1968-69		1978-79		1982-83	
	Millions of tonnes	%	Millions of tonnes	%	Millions of tonnes	%	Millions of tonnes	%
Canada	7.9	22.3	8.4	18.8	13.5	19.0	21.4	20.7
USA	12.0	33.8	14.7	32.9	32.4	45.5	41.4	40.0
Australia	2.0	5 6	5.4	12.1	7.2	10.1	7.3	7.1
EEC	n/a**	—	5.0	11.2	7.8	11.0	21.2	20.5
Argentina	2.8	7.9	2.8	6.3	3.3	4.6	9.8	9.5
Others*	10.8	30.4	8.4	18.8	7.0	9.8	2.3	2.2
Total	35.5	100	44.7	100	71.2	100	103.4	100

*Others include Western Europe (excluding EEC), Eastern Europe, Turkey and India, for example

**The EEC was formed in 1958

Source: Canada West Foundation Task Force 1980, Statistics Canada 1983

on appropriate shares for member countries. Today, however, the total levels of subsidies, the scale of surpluses, and the effect of CAP on other economic sectors are being questioned. Rationalists, however, have forecast for the last five years that EEC agricultural subsidies would either decline or at least stabilize in real terms. This has not happened even though Europe has been passing through an economic recession that has led to severe restraints in other types of government expenditures.

All that can be concluded about this major competitor is that it makes no physical or economic sense for the EEC to remain a major wheat exporter or to capture a larger share of the wheat export market. However, it is perfectly capable of doing so, particularly since agricultural subsidies and high consumer food costs are still only a small percentage of a massive industrial economy.

2.1.2 Coarse Grains

Table 2 outlines the situation for the export of coarse grains over the last 25 years. (Coarse grains include corn, sorghum, millet, barley, rye, and oats.)

Table 2. World coarse grain exports (July -- June crop year)

Exporter	1957-61 (average)		1968-69		1978-79		1982-83	
	Millions of tonnes	%	Millions of tonnes	%	Millions of tonnes	%	Millions of tonnes	%
Canada	1.4	6.3	0.6	1.6	3.9	4.3	7.1	7.2
USA	10.9	49.3	16.0	43.7	57.1	63.6	54.0	55.0
Argentina	3.0	13.6	5.6	15.3	11.5	12.8	11.6	11.8
EEC	n/a	–	2.1	5.7	6.7	7.5	15.3	15.6
Others	6.8	30.8	12.3	33.6	10.6	11.8	10.1	10.3
Total	22.1	100	36.6	100	89.8	100	98.1	100

Source: US Department of Agriculture 1984a, Canada West Foundation Special Task Force 1980

The USA dominates the trade in coarse grains to an even greater extent than it does the wheat trade. This is chiefly due to its natural advantages, management experience, and research support in the growth of corn. Argentina, which is also a major corn grower, has been able to maintain an approximately stable share of a market which has increased by 440 percent in the last 25 years. Again the importance of a number of ''Other'' suppliers has declined substantially though not to the same extent as with wheat.

The share of the EEC has expanded, though the tendency is for the EEC to enter the market to clear surplus supplies and then withdraw. However, the continued high subsidy level brings forth excessive coarse grain supplies in the EEC which has led to major intermittent entry into the market.

Canada is essentially limited to the export of one coarse grain (barley) and though not a major supplier in the coarse grain trade, has been able to maintain and even increase its share slightly over the last 25 years. There is a pattern with both wheat and coarse grains of a falling off in Canada's share of the trade during the late '60s and '70s, presumably due to the congestion of the transportation system in the boom period, with substantial increases in total volume and a recapture of market share during the '80s when the railways were again able to move increased volumes of grain (due to rolling stock provided by the federal and provincial governments and the lack of competition from non-grain movements).

The ability of Canadian agriculture to compete successfully during this period has been astounding. The competition has been fierce. The USA has been able to obtain spectacular increases in yields for its major coarse grain crop, corn, and substantial subsidy has been provided to the American farmer. For Canada the major subsidy has been for transportation to export positions: over 70 percent of the federal agricultural subsidy has gone to transporting grain to export market positions and this has had to be paid for by the lack of access to the transportation system. (A fuller discussion of subsidies is found later in this chapter in Section 2.1.4.1). In spite of this, when transportation capacity became available, Canada recaptured all of its share of the coarse grain export trade and most of its share in wheat exports.

Will the competition be as fierce again in the next 25 years? It would if the following conditions apply:

1) The real levels of subsidy in the EEC and the USA continue at their present levels.

2) Our transportation system is allowed to deteriorate to such an extent that it is not capable of transporting substantially increased grain volumes.

3) The rate of return (export price less cost of transportation) does not cover input costs of the farmer plus sufficient profit to induce him to plant and harvest.

Since exactly these conditions did apply at times during the '60s and '70s, it is not possible to say that they will not recur. However, we do not usually make the same major mistakes twice; we find new ones. With mounting deficits and strained budgets, additional agricultural subsidies in the USA and EEC are less rather than more likely. We would have to be particularly perverse to neglect our transportation system in the future as we have in the past.

The most likely situation is one where the returns are not sufficient to cover the costs of inputs. This, of course, occurs each and every year. There are always farms and farmers that cannot succeed. In the past there has always been someone to step in and take over a farm or incorporate the land in another operation because he believed he could do it a bit better, or more efficiently. The fact that the agricultural industry has been able to come through the turmoil of the last 25 years in as good shape as it has essentially indicates that those individual decisions were collectively sound.

2.1.3 Oilseeds

Canada seems to have an advantage in flaxseed production (see Table 3). That should provide an advantage in maintaining export levels over the long term.

Canola is the major oilseed crop in Alberta. Before 1970 Canadian production of rapeseed was negligible and demand for the produce was hindered by the high erucic acid and glucosinolates content of rapeseed varieties.

With the advent of double O varieties (those with low or no erucic acid and glucosinolates content), signified by the new trade name "canola", the market was essentially brand new. The experience of even the early '70s is no guide to current or future demand

Table 3. Yields of Flaxseed

	Yield* (bu/ac)	(kg/ha)
Canada	15.3	(960)
Argentina	12.9	(810)
USA	12.4	(778)
Others	10.1	(634)
India	3.9	(245)
USSR	3.0	(188)

*Average of crop years 1977-82 (5 years).

Source: US Department of Agriculture 1984b

and market penetration. For example, canola meal is now an excellent animal feed, whereas rapeseed meal caused problems with its high erucic acid and glucosinolates content. Just recently canola was given full clearance for import into the US market by the US Department of Health. Certain advantages of canola oil over soybean oil indicate that it has characteristics which should enable it to secure a niche in the huge American market.

Table 4 indicates the extent and direction of the export trade in canola from 1979 to 1983.

Table 4. Exports of Canola/Rapeseed

	1979-80	1980-81	1981-82	1982-83
		(thousands of tonnes)		
Canada	1,742.8	1,372.2	1,359.3	1,271.3
World	2,102.0	2,305.0	2,169.0	2,416.0
Canada as % of World	82.9	59.5	62.7	52.6

Source: Statistics Canada 1983, 1984a

A four-year period is not sufficient to establish any trend. However, Canada does not seem to be maintaining its competitive position in canola export. This suggestion is reinforced when Canadian yields are compared with competitive countries (Table 5).

Table 5. Yields of Rapeseed

	Average 1977-82 (5 Years)		1982-83 Crop Year		1983-84 Forecast	
			bu/ac	(kg/ha)		
EEC	42.0	(2,354)	46.8	(2,623)	39.0	(2,186)
East Europe	34.3	(1,922)	32.8	(1,838)	40.6	(2,275)
Canada	21.1	(1,183)	22.6	(1,267)	20.6	(1,155)
Others	16.2	(908)	16.2	(908)	15.8	(886)
China	14.9	(835)	24.5	(1,373)	20.4	(1,143)
India	8.7	(488)	10.5	(588)	11.0	(617)

Source: US Department of Agriculture 1984b

There is no doubt that Canada has an acceptable oilseed product in canola, with some advantage over other products, including low cholesterol levels. Production of canola fell after peaking at about 3.4 million tonnes in 1978 and 1979, falling to around 2 million tonnes in 1983. At the same time crushings increased, partly for export and partly for newly developing domestic markets. Exports could only be maintained by drawing down on stocks in commercial positions (see Table 6) and by reducing stocks on farms (Table 7).

Table 6. Rapeseed/Canola ending stocks

	1979-80	1980-81	1981-82	1982-83
		(thousands of tonnes)		
Canada	1,476.9	1,327.9	692.4	477.7
World	1,708.0	1,489.0	839.0	643.0
Canada as % of World	86.5	89.2	82.5	74.3

Source: Canada Grains Council 1983

Table 7. Stocks of Rapeseed/Canola on farms as of July 31

	1979	1980	1981	1982	1983
	(thousands of tonnes)				
Rapeseed/Canola	249	340	404	71	40

Source: Statistics Canada 1984a

2.1.4 Long-Term Grain Markets

Forecasting long-term food markets is not a science. It has been likened to science fiction. There are only a few eternal truths. There will be more people around in 2010 than there are now and all of them will wish to eat. It has been noted in the last 25 years that a universal mark of increasing affluence is to switch from a cereal diet to one relying more heavily on meat. This has been as characteristic of the Slavic Communists as the free-enterprising Japanese. As more nations achieve affluence we can anticipate that their preferences, or the preferences of a widening affluent elite, will switch to meat. Current candidates for this transition are the Koreans, Taiwanese, and Malaysians, and there are other major candidate countries to follow.

The other major factor is a reduction in the number of nations in the grain export trade. The EEC has been the only new entrant into the trade in the last 25 years. It is difficult to identify potential major new entrants to the grain export trade; indeed the major speculation revolves around how long the EEC can tolerate the financial hemorrhaging that is necessary to maintain the EEC share of the world's grain export trade. The People's Republic of China has recently changed from a net importer of grain to a net exporter. The Chinese have benefited from recent good weather but mainly from the adoption of the private reward (market) system in agriculture. The ability of the individual farmer to increase production, when left free to make his own decisions, is impressive. However, China will need all of its productive capacity to meet its own food requirements, particularly if, through the adoption of private enterprise in the remainder of the economy, a more affluent middle class develops. If the previously mentioned trend is followed, increasing affluence will mean a shift away from the consumption of vegetables and grains to the consumption of more meats and poultry. There may be a lag between rising income levels and changing food consumption patterns, but if trends in the remainder of Asia hold true the need for feed grains should expand substantially with increasing incomes, effectively utilizing China's potential surplus.

Table 8 indicates the intensity of agriculture in some of our major competitors. For the EEC, four countries are illustrated: France, Germany (Federal Republic), the Netherlands, and the United Kingdom (UK).

Some of the measures of intensity identify structural differences in agriculture, such as the extremely low farm population in Australia due to the extensive grazing which

Table 8. Measures of agricultural intensity

	Population Economically Active in Agriculture		Tractors, Combine Harvesters, and Threshers in Use		Consumption of Commercial Nitrogenous, Phosphate, and Potash Fertilizers		Wheat	Barley
	People per 1/4 Section Agricultural Land		Machines per 1/4 Section Agricultural Land		Tonnes per 1/4 Section Arable and Cropland		Tonnes per Acre (average yield)	
Country	1970-71	1980-81	1970	1980	1970-71	1980-81	1973-82	1973-82
Alberta*	0.8	0.6	0.6	0.7	1.8**	4.4**	0.81	0.98
Canada	0.6	0.4	1.1	1.2	1.2	2.8	0.76	0.95
USA	0.4	0.3	2.0	1.8	5.3	7.2	0.87	1.02
Australia	0.1	0.1	0.6	0.6	1.4	1.6	0.51	–
France	5.9	4.0	4.7	5.7	16.0	19.5	1.87	1.54
West Germany	10.9	6.7	8.9	9.2	24.8	26.8	1.93	1.70
Netherlands	12.8	9.2	10.3	13.2	46.8	48.8	–	–
UK	2.5	1.8	4.7	5.2	17.6	19.0	–	1.68

* Information provided by Alberta Agriculture
** Based on sales of fertilizer

Source: Adapted from United Nations 1983 characterizes the country's agriculture. However, the major competitor (after the USA) in grain exports is the EEC. Within the EEC the major grain producer is France, followed by the UK. In European terms these two countries are relatively low intensity, low-cost producers. The figures for farm laborers, machines, and fertilizer application per unit of area were half or less of the most intensive producers (for example, the Netherlands).

Under the Common Agricultural Policy (CAP), prices and subsidies are established so that the least efficient producers (such as Germany and the Netherlands) can survive. That gives relatively efficient producers such as France and the UK an incentive to increase inputs of machinery, men, and chemicals much beyond the levels that would be appropriate if world prices rather than CAP prices prevailed. The result has been surpluses, growing more massive with each year and extending into more and more products.

As can be observed from Table 8, the UK (which is one of the EEC's more efficient agricultural producers) has barley yields which are 1.8 times the Canadian average, but at the expense of 4.5 times the agricultural labor, 4.3 times the machinery per unit of land, and 6.8 times the fertilizer per unit area. Higher inputs will result in higher yields but costs will also be higher, and this is what has happened in the EEC. It is doubtful that the EEC has even achieved its objective of security of food supplies since the high yields have been achieved through extensive applications of energy to the land (in the form of fertilizers and fuel) and this energy is imported to the EEC, for example, by gas pipeline from the USSR.

2.1.4.1 Subsidies

In internationally marketed crops Canada has one of the lowest rates of government subsidy. Glenn, Carter, and Tangri (1983) estimate that in the 15-year period from 1965 to 1979, the Canadian subsidy for wheat averaged 11.6 percent while the subsidy in the US averaged 18.5 percent of the value of production. Roberts and Tie (1982) have estimated that for 10 years including and prior to 1981-82, the average subsidy to EEC grain producers was 33 percent of the value of production. Most of the Canadian subsidy for grain production came in the form of shielding from transportation costs through the Crow rate. Since the amount of subsidy from the federal government to transportation has been stabilized, the rate of subsidy to Canadian grain farmers is likely to drop over the short and medium term.

If subsidy levels are reasonably equivalent, Canada should be able to remain competitive with the US in the sale of wheat, though there is no doubt that the US, with the advantage of corn production, will remain dominant in the export of coarse grains. In this trade Canada will remain predominantly a residual supplier, though with special customers for malting-grade barley.

The major question mark is the continued competitive position of the EEC with its subsidy level three times that enjoyed by Canadian growers. EEC surpluses are exported, not at the high CAP price levels, but at whatever price is necessary to move the product in the world market. The EEC is sufficiently rich to continue to do this for at least as long as it has already (25 years).

However, each year the fiscal burden becomes larger, the support for the subsidy level more difficult to obtain, and the objections of EEC farmers to any stabilization or reduction more ritualistic and ultimately boring to the urban-industrialized majority of the EEC's population. Under these circumstances the probability of the EEC increasing its share of the world grain export trade seems slim, and the best guess is that it will be able to maintain current physical volumes of trade.

2.1.4.2 Forecasts

The farther into the future market forecasts are made, the less likely they are to be right. In 1980 the Canadian Wheat Board developed the targets shown in Table 9 for 1990 export levels.

Table 9. Targets for 1990 Canadian export levels

	million tonnes
Wheat	22.0
Coarse Grains	8.5
Oilseeds	3.5
Total	34.0

Source: Adapted from Canada West Foundation Special Task Force 1980

As of the 1983-84 crop year, it seems that the Wheat Board is on target overall. Wheat exports are above target, coarse grains on target, and oilseeds much below target. When this forecast was made in 1980, it was attacked as overly ambitious. It was suggested that without substantial price increases, or input cost reductions, the targets would never be achieved. So far at least, grain prices have not increased, while input prices have increased overall, yet production and deliveries have increased spectacularly in grains. Indeed, if current trends persist, the 1990 grain forecasts instead of being too high are likely to be too low. This does not apply to oilseeds, as is considered in Section 2.1.5.

On the basis of current evidence, then, the Wheat Board's forecast for grain exports in 1990 is being approached in the 1983-84 crop year and could well be exceeded before 1990. However, we are concerned with potential market demands over the longer term, say to the year 2010. If forecasting in the medium term to 1990 is difficult, forecasting over the longer term to 2010 is next to impossible.

Basically, long-term forecasts start off with the assumption that, unless there are radical changes, the future will be much like the past. One of the most authoritative estimates of the world's long-term grain trade was prepared for Resources for the Future, Inc. (RFF) of Washington, DC (Crosson and Brubaker 1982). The Panel accepts their projection of 160 million tonnes of wheat in the world export trade in 2010 as well as their estimate that the US will supply 70 million tonnes of this total export level. Table 10 presents a comparison of the world wheat export levels and shares in 1982-83 and those predicted for 2010.

Table 10. Comparison of world wheat export levels and shares in 1982-83 and in 2010

	1982-83		2010	
Exporter	Million tonnes	%	Million tonnes	%
Canada	21.4	20.7	42	26.3
USA	41.4	40.0	70	43.8
Australia	7.3	7.1	11	6.9
EEC	21.2	20.5	21	13.1
Argentina	9.8	9.5	15	9.4
Others	2.3	2.2	1	0.6
Total	103.4	100	160	100

Source: Adapted from Crosson and Brubaker 1982

Table 10 was developed by assuming that Canada would be a residual supplier of wheat in the world export trade in 2010. The total volume and the US share are from the RFF forecast. Argentina and Australia are assumed to be able to maintain their current shares of the trade. The EEC is assumed to maintain its current physical volume but not to increase its share, while the "Others" are assumed to continue to lose both share and volume as they have done in the past.

For coarse grains, a similar table follows. The method followed for coarse grains was the same as for wheat. The total and the US volume of exports are from RFF. Argentina and the "Others" were considered capable of maintaining constant shares of the export trade (leading to major expansions in volume). The EEC is expected to maintain its physical volume of coarse grain exports but reduce its share substantially. Canada then becomes the residual supplier, with a share that coincidentally is equivalent to its 1982-83 share of the

Table 11. Comparison of world coarse grains export levels and shares in 1982-83 and in 2010

Exporter	1982-83 Million tonnes	1982-83 %	2010 Million tonnes	2010 %
Canada	7.1	7.2	19	7.4
USA	54.0	55.1	167	65.0
Argentina	11.6	11.8	30	11.7
EEC	15.3	15.6	15	5.8
Others	10.1	10.3	26	10.1
Total	98.1	100	257	100

Source: Adapted from Crosson and Brubaker 1982

coarse grain trade. Since Canada has no clear advantage in the export of coarse grains as it does in wheat, a forecast which does not anticipate an increase in share would seem to be realistic.

The estimates in Tables 10 and 11 forecast an approximate doubling of the total grain trade between 1982-83 and 2010, a period of 27 years. The experience of the last 24 years saw an increase in the total grain trade of 3.36 times. Increases in the future are therefore expected to be slower than increases have been in the past.

2.1.5 Long-Term Oilseed Markets

As noted in Table 9, the Canadian Wheat Board estimate of exports of oilseeds in 1990 is 3.5 million tonnes. Of that, 0.5 million tonnes would be flaxseed. By 1990 perhaps a further 0.5 million tonnes could be accounted for by other oilseeds (sunflower, mustard, and soybeans), leaving a demand for 2.5 million tonnes of canola in the export trade.

Table 12 identifies the extent of Canadian flaxseed exports. Overall there has been a slight growth in flaxseed exports since the late '50s but not enough to establish any trends. Canada's natural advantage in flaxseed production should allow the maintenance of an export level of about 500,000 tonnes per year over the long term.

For canola, there is no long-term export experience to serve as a basis for future trends. New markets have been opening up for canola for crushing and meal; old markets, such as Japan, have maintained purchases at high levels and have indicated an interest in increased purchases. Future demand looks bright in the US, Mexico, the EEC, India, and other locations. There is little doubt that additional canola could be disposed of if it were to be available for export by 1990. The market is there.

What is lacking is a commitment by an increasing number of farmers to plant increasing acreages of canola. Many farmers were attracted to canola by the high prices of the late

Table 12. Canadian Flaxseed exports

	Time Period (years)	Average Production per year (tonnes)
1956-61	5	384,000
1969-74	5	501,000
1979-83	4	474,000

Source: Canada Grains Council 1983

'70s, but did not master the management techniques essential for adequate yields and dropped out of canola when prices fell. With a price improvement in the 1984-85 crop year, no doubt many will return to canola. However, "in and outers" are not the best way to develop a market for a product or a reputation for reliable delivery. It is appropriate that the Canola Council of Canada and Alberta Agriculture are concentrating on improving management practices and production for canola growers. Given the differences in yields in the EEC and Eastern Europe there would seem to be room to increase the average yield of canola substantially. In Alberta the 10-year (1971-81) average yield was 19.7 bushels per acre. If average yields could be increased to 25 bushels per acre by 1990, the net returns to the farmer could be sufficiently attractive to bring forward additional supplies even at prices little above those of 1981-83.

It is difficult to identify the potential market for canola. Crosson and Brubaker (1982) forecast a tripling of the world soybean oilmeal trade between 1979-80 and 2010, from 53.9 million tonnes to 151 million tonnes soybean equivalent. With major producers like India, China, and Eastern Europe already used to rapeseed oil, it should be possible for rapeseed/canola to increase its share of world oilseed trade from 4 percent of soybeans as of 1979-80 to 5 percent of soybeans in 2010. For the year 2010 this would represent about 7.5 million tonnes. Canada accounted for as much as 83 percent of the total trade in rapeseed/canola in 1979-80, but dropped as low as 52 percent in 1982-83. If Canada is going to be competitive in the future, it will have to account for about two-thirds of the world canola trade, giving a target for 2010 of approximately 5 million tonnes. This represents a substantial production increase, particularly in the context of the Wheat Board target of 2.5 million tonnes in 1990. However, the major restriction would be the ability to produce, not availability of markets.

2.1.6 Domestic Consumption of Grains and Oilseeds

The Canada Grains Council (1983) forecasts the following levels of domestic consumption for livestock feed, waste, and dockage by 1990:

Fed within the Prairies	7.4 million tonnes
Processed on the Prairies	3.5 million tonnes
Shipped as feed to BC	0.4 million tonnes
Shipped to Eastern Canada	3.5 million tonnes
Total	14.8 million tonnes

For feed, the proportions of barley, wheat, and oats have usually run 60 percent barley, 25 percent wheat, and 15 percent oats. These fluctuate wildly given the relative prices of grains. Corn will be substituted if it is cheap.

In addition, the Canada West Foundation (Canada West Foundation Special Task Force 1980) makes the following estimates of Canada's domestic requirements in 1990:

Wheat for flour milling	2.5 million tonnes
Canola for vegetable oil processing	1.0 million tonnes
Barley for malting	1.0 million tonnes

Total domestic Canadian requirements for the major grains and oilseeds in 1990 would therefore be:

Wheat	6.2 million tonnes
Barley	9.9 million tonnes
Oats	2.2 million tonnes
Canola	1.0 million tonnes

Beyond 1990 the assumption is that growth in domestic consumption will expand in line with population growth. Statistics Canada has made an estimate of population in 2006 based on the demographics of the 1981 census, of 29,087,700 (Statistics Canada 1984b). The needs of a population expanding at this rate would be met by the following in 2010:

Wheat	7.2 million tonnes
Barley	11.4 million tonnes
Oats	2.5 million tonnes
Canola	1.2 million tonnes

2.1.7 Alberta's Share of Markets in 2010

There is a remarkable consistency in Alberta's share of the Prairie provinces' production of grains and oilseeds (see Table 13). Between 1960-65 and 1979-83, many factors changed on the Prairies. Total average production of major grains and oilseeds nearly doubled from 20.8 million tonnes in 1960-65 to 36.9 million tonnes in 1979-83. Barley production during this period increased by more than three times from 3.3 million tonnes to 10.5 million tonnes, while rapeseed production increased by 12 times from 200,000 tonnes to 2.3 million tonnes. Oats, on the other hand, declined from 3.5 million tonnes in 1960-65 to 2.2 million tonnes in 1979-83, a decline of 37 percent.

However, in spite of these changes, the proportion of production accounted for by Alberta remained remarkably consistent, at least for the major crops. Alberta accounted for 23.2 percent of Prairie wheat in 1960-65, 23.8 percent in 1965-70, and 25.6 percent in 1979-83. For barley it dominated production with 60.6 percent in 1960-65, and still dominated with 55.2 percent in 1979-83. With rapeseed Alberta accounted for between 42.1 percent and 44.4 percent of production in the 1960-70 period, while it accounted for 43.5

Table 13. Total production from the Prairie provinces and percent of production in Alberta

		Wheat	Barley	Oats	Rapeseed
Average 1960-65	Millions of tonnes	13.8	3.3	3.5	0.2
	% Alberta	23.2	60.6	42.8	42.1
Average 1965-70	Millions of tonnes	17.6	5.7	3.6	0.5
	% Alberta	23.8	57.9	38.8	44.4
1971	Millions of tonnes	13.7	12.2	4.3	2.0
	% Alberta	17.5	39.3	34.8	35.0
1972	Millions of tonnes	13.8	10.6	3.2	1.1
	% Alberta	23.1	47.1	37.5	45.5
1973	Millions of tonnes	15.4	9.5	4.1	1.0
	% Alberta	22.1	44.2	41.4	40.0
1974	Millions of tonnes	12.5	8.1	2.9	1.0
	% Alberta	21.6	50.6	41.4	40.0
1975	Millions of tonnes	16.2	8.8	3.4	1.6
	% Alberta	22.2	55.7	41.2	37.5
1976	Millions of tonnes	22.6	9.7	3.8	0.7
	% Alberta	21.7	55.7	42.1	42.8
1977	Millions of tonnes	18.7	11.1	3.3	1.9
	% Alberta	17.1	48.6	39.4	42.1
1978	Millions of tonnes	20.5	9.6	2.6	3.3
	% Alberta	20.0	51.0	42.3	42.4
1979	Millions of tonnes	16.2	7.6	2.0	3.1
	% Alberta	24.7	59.2	55.0	45.1
1980	Millions of tonnes	18.1	10.2	2.0	2.3
	% Alberta	29.3	58.8	60.0	47.8
1981	Millions of tonnes	23.7	12.5	2.4	1.7
	% Alberta	26.1	55.2	50.0	41.1
1982	Millions of tonnes	26.1	12.5	2.7	2.0
	% Alberta	22.6	52.8	48.1	45.0
1983	Millions of tonnes	25.5	10.0	2.0	2.5
	% Alberta	26.6	50.0	50.0	44.0
Average 1979-83	Millions of tonnes	21.9	10.5	2.2	2.3
	Alberta production	5.6	5.8	1.2	1.0
	% Alberta	25.6	55.2	54.6	43.5

Source: Statistics Canada 1975, Canada Grains Council 1984 percent of the canola produced on the Prairies in 1979-83. For the two largest crops, wheat and barley, there was an expansion in share of wheat of about 2 percent, and a decline in share of barley production of between 2 and 6 percent. With oats Alberta accounts for a 12 to 16 percent larger share of a substantially declining market.

This stability in view of substantial changes in markets and production methods indicates that:

1) Prairie farmers tend to react similarly to market signals. If there is an expanding market for wheat, canola, or barley, they will respond to it to the extent that climate and soil permit.

2) There are certain long-term advantages to growing certain crops in certain provinces: Alberta for barley, Saskatchewan for wheat, Manitoba for flaxseed. Once these advantages are identified they tend to persist.

3) From a market potential point of view the most accurate forecast of provincial shares in the 1979-83 period was shares in 1960-70. There is no reason to believe that shares in 2010 will vary greatly from those in 1979-83. There has been a revolution in Prairie agriculture between 1960-65 and 1979-84, and yet crop shares, except for oats, have not varied that much.

Therefore Alberta is expected to account for the following approximate shares of the Prairie production of grains and oilseeds in 2010:

Wheat	26 percent
Barley	55 percent
Oats	55 percent
Canola	44 percent

2.1.8 International Food Aid

In the 1982-83 crop year Canada exported 28.8 million tonnes of grain. Of this amount, 785,050 tonnes, or 2.7 percent of the total volume exported, represented food aid shipments.

In Table 14 the experience of developing countries in importing cereals and the share represented by food aid is identified. Overall the dependence of developing countries on food aid declined from 39 percent in 1961-63 to only 8 percent in 1981, while the total volume of imports increased from 30.0 million tonnes to 97.2 million tonnes. Even for low-income countries (per capita incomes below $300 US per year) the proportion of food aid cereal imports declined from 61 percent in 1961-63 to 40 percent in 1981. Most remarkable is the expansion of commercial imports by the middle-income developing countries from a level of 9.4 million tonnes in 1961-63 to 43.4 million tonnes in 1981, an increase of 4.6 times in 20 years.

This trend to increasing reliance on commercial imports is expected to continue, largely because the ranks of the wealthier developing nations is expected to swell. It is expected that the distribution of developing countries by income in 1976-78 and 1990 will be as shown in Table 15. (Income in both instances is in 1977 US dollars.)

Table 14. Commercial import and food aid grain for developing countries

Region or Income Group	Year	Commercial Imports	Food Aid	Total Grain	Share of Food Aid in Total Grain
		(million tonnes)			(%)
High-Income	1961-63	5.6	3.1	8.7	36
Developing	1976-78	21.6	1.0	22.6	4
Countries	1981	40.3	0.5	40.8	1
Middle-Income	1961-63	9.4	3.2	12.6	25
Developing	1976-78	26.7	2.7	29.4	9
Countries	1981	43.4	3.4	46.8	7
Low-Income	1961-63	3.4	5.3	8.7	61
Developing	1976-78	6.8	4.3	11.1	39
Countries	1981	5.8	3.8	9.6	40
Total	1961-63	18.4	11.6	30.0	39
Developing	1976-78	55.1	8.0	63.1	13
Countries	1981	89.5	7.7	97.2	8

Note:

Low-Income Countries — per capita income below $300 (US)
Middle-Income Countries — per capita income between $300 and $900 (US)
High-Income Countries — per capita income over $900 (US)

Source: Adapted from Huddleston 1984

Table 15. Changes in per capita income of developing countries

	Less Than $300	$300 – $900	Over $900	Total
1976-78	34	39	26	99
1990	25	32	42	99

Source: Huddleston 1984

Middle-income developing countries are expected to graduate into the ranks of high-income countries while the number of low-income countries is expected to decline by 27 percent.

If these forecasts are well founded, the need for food aid is likely to decline rather than increase in the future, not because there are fewer people or less need but because it will be possible for greater numbers of developing countries to afford cereal imports as their income expands.

However, there will always be a need for food aid, in some instances to tide what is a comparatively high-income country over a temporary financial difficulty. In other instances the food aid is a requirement due to natural disasters, such as flood, drought, or infestation. But the world picture of the developing nations is not one of doom and gloom; rather, it is one where the bulk of developing nations have experienced rising incomes and have used some of that increased income to import additional cereals.

There is no reason to expect that future Canadian exports can only be sustained by increasing levels of food aid. Food aid as a percentage of total Canadian grain exports declined during the '60s and '70s and though it will temporarily fluctuate it is unlikely to be above 5 percent of total exports in 2010, well within our charitable capacity.

2.2 Yields

Table 16 shows five-year moving averages of yields in bushels per seeded acre on stubble and fallow from 1958 to 1982 for wheat, oats, barley, and rapeseed/canola. In addition, the yield of tame hay in tons per acre for the same period is provided. This information is presented graphically in Figure 1.

Over the 20-year period examined, the following annual average percentage (compound) increase in yields was achieved.

	Average % Increase per Year (compound)	
	Fallow	Stubble
	(bushels/seeded acre)	
Wheat	2.29	4.09
Oats	1.58	2.67
Barley	2.03	3.45
Rapeseed/Canola	1.43	3.34
	(tons/acre)	
Tame Hay	1.59	

Table 16. Yields for tame hay, wheat, oats, barley, and rapeseed/canola on fallow and stubble in Alberta

	Tame	Wheat		Oats		Barley		Rapeseed/Canola	
	Hay	Fallow	Stubble	Fallow	Stubble	Fallow	Stubble	Fallow	Stubble
				(5-year moving average)					
1958-62	1.37	20.6	13.2	47.1	33.7	35.3	23.7	17.1	10.0
1959-63	1.42	21.7	14.3	50.4	37.4	36.8	25.5	18.2	10.5
1960-64	1.42	22.0	14.6	51.5	38.2	37.6	26.0	18.6	10.5
1961-65	1.52	23.3	15.9	53.8	39.8	39.4	27.2	18.5	10.6
1962-66	1.58	26.3	18.1	58.2	41.7	43.8	29.7	19.0	11.0
1963-67	1.56	27.3	18.6	57.6	40.9	44.7	29.9	18.7	11.0
1964-68	1.50	27.6	18.8	57.7	40.5	45.9	30.9	18.4	11.3
1965-69	1.50	28.4	19.7	59.5	42.9	47.6	32.5	17.9	11.0
1966-70	1.47	28.6	20.0	60.9	44.5	48.7	33.8	18.4	11.6
1967-71	1.49	27.5	19.7	59.9	45.0	47.2	33.1	17.5	11.1
1968-72	1.56	28.2	20.9	62.9	47.9	49.3	35.4	18.0	12.2
1969-73	1.69	28.3	21.4	63.1	49.5	49.1	35.7	18.1	12.1
1970-74	1.78	27.7	21.6	61.2	48.8	47.6	35.4	18.4	12.6
1971-75	1.76	28.3	22.1	61.9	48.6	47.7	35.9	18.4	13.1
1972-76	1.75	29.9	23.1	63.9	50.2	49.4	37.7	19.2	14.0
1973-77	1.74	29.2	22.9	63.2	50.9	48.9	38.6	20.0	14.9
1974-78	1.79	29.6	23.9	62.3	50.3	49.1	40.0	20.7	16.5
1975-79	1.81	30.1	25.4	63.6	52.9	50.0	42.3	21.1	17.3
1976-80	1.82	30.3	27.0	63.7	55.1	51.0	44.1	22.2	18.3
1977-81	1.87	30.6	27.8	63.0	55.8	51.3	45.1	22.6	19.0
1978-82	1.88	32.4	29.4	64.4	57.1	52.8	46.7	22.7	19.3

Note: Wheat, oats, barley and rapeseed/canola in bushels per seeded acre; tame hay in tons per acre

Source: data from several Alberta Agriculture publications: *A Historical Series of Agriculture Statistics for Alberta*, 1969; *Statistics of Agriculture for Alberta*, 1966-67 to 1969-70 inclusive; *Agriculture Statistics Yearbook*, 1972-1982 inclusive

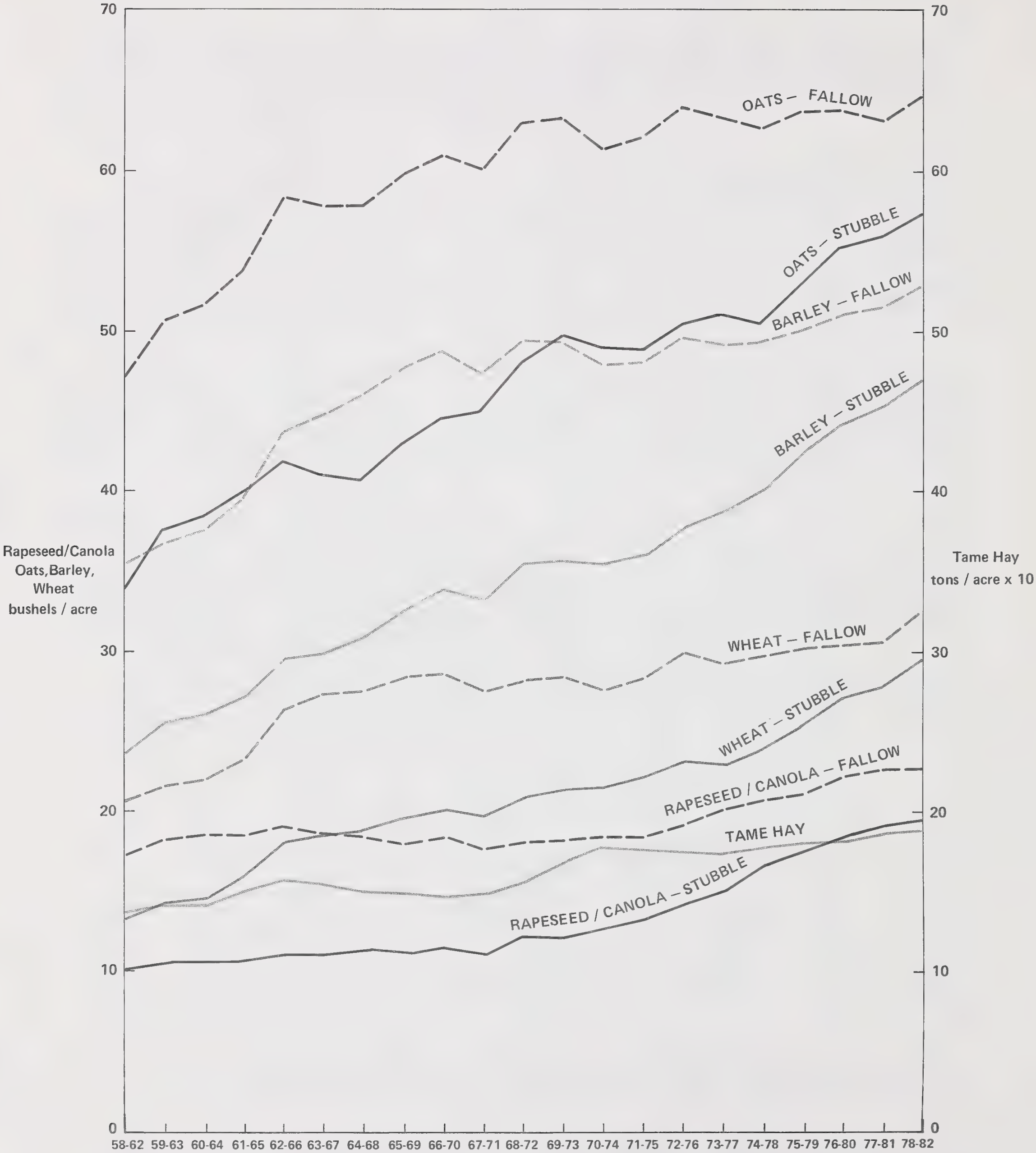


Figure 1 Yields for tame hay, wheat, oats, barley, and rapeseed/canola on fallow and stubble in Alberta

By 5-year moving averages

Source: Table 16.

As can be seen, the bouyant increases in yields over the last 20 years have come particularly from yield growth in crops seeded on stubble. For tame hay and for crops seeded on fallow, yield increases have been much less spectacular. Much of the increase in yields on stubble may be due to better management of stubble-seeded crops and as fallow and stubble yields converge, rates of increase in overall yields may decline.

Yields are subject to many influences. Weather varies from year to year, although the effect of annual variability can be smoothed by the use of long-term averages. From settlement to 1950, a fairly steady downward influence on yields was exerted by declining soil fertility and physical condition and by a steady worsening of weed infestations (Canada West Foundation 1980). After 1950 the use of improved machinery, additional chemicals in the form of fertilizers and herbicides, better varieties, and improved management reversed these declines.

There is no doubt that yields can be increased substantially over present levels. It can be shown that potential spring wheat yields on experimental stations are about 67 percent higher than actual farm yields. Typically, however, there is less constraint on crop inputs on an experimental station. It can also be shown that yields of barley in France between 1973 and 1982 were 57 percent higher than in Alberta (see Table 8). If an Alberta farmer received the prices that a French farmer does there is no doubt he would quickly increase his yields, probably toward the level achieved by Canadian experimental farms. However, the Alberta farmer can only apply so much labor, machinery, or fertilizer to each acre, since he must be very aware of the cost of achieving each increment of yield. Most particularly he must ration his time, because there are only so many hours in the day, particularly at seeding and harvest time.

The yields that Albertans achieve come close to representing the best possible compromise, the best application of a limited amount of money and time to bring the greatest return per acre. It would be possible to achieve higher yields but only at greater costs, under current factor prices. There is therefore little reason to expect major yield increases in the short term, even though there is the physical potential to increase yields, unless real prices for crops were to increase substantially. Furthermore there are some factors conducive to future yield declines:

a) Rising Real Energy Costs — Energy feedstock costs represent about 20 percent of the cost of nitrogen fertilizers and a substantial proportion of the cost of operating farm machinery. Though it is possible to foresee stabilizing or even declining petroleum and natural gas prices over the next decade, the outlook over the longer term (to 2010) is for the relative cost of energy to rise. Thus, energy costs will be rising at a time when the application of fertilizer and herbicides should be increased, not decreased, to obtain higher yields.

b) Decreasing Soil Productivity — Increasing rates of wind and water erosion, salinization, and acidification can all be overcome, but at some additional cost. For example, the principal source of increasing acidification in Alberta is the application of nitrogen fertilizers, which are essential to maintain or increase yields. Acidification can be readily overcome by the application of lime, and though there is substantial provincial assistance toward the cost of transporting lime, it is still costly to procure and apply.

c) Expansion of Production onto Marginal Lands — The land presently under cultivation is essentially the easiest, best, and cheapest land to cultivate. Unimproved land on farms is land that has been considered too stony, sandy, wet, or rough to clear and cultivate. If it were brought into cultivation it would require additional capital or higher operating expenses to maintain yield levels. Similarly with land on the frontier — it will cost more to clear and develop and its potential productivity is usually below average. Again it is possible to overcome these disadvantages, but at a cost.

Those trends that are conducive to yield increases essentially revolve around scientific advances and the application of research. The cost of a new higher yielding or frost-resistant cultivar is minimal to the farmer but can often improve yields substantially. So can the adoption of advice from the District Agriculturalist, or a neighboring farmer, on the placement of fertilization, the setting for spraying, or the way to reinforce a hitch. Good management advice should reduce per-unit costs.

Anderson (1983) has estimated that 40 percent of yield increases in Alberta have been due to fertilizers and other chemicals, 22 percent to biological and genetic improvements (new varieties and cultivars), 20 percent to mechanical improvements (better machinery for cultivating, planting, and harvesting), and 18 percent to improvements in management and all other factors.

In the past, 60 percent of yield increases have been due to chemical or mechanical improvements that increased the total cost of inputs to farming. As can be seen from the EEC examples, substantial yield increases are still possible following this route, and if prices of crops were to improve relative to these input costs, yields could be expected to be increased substantially.

The other 40 percent of yield increases has been due to improvements that cost the farmer little, such as better seed and good information. These factors are not, however, costless; they are usually the result of research and development, principally provided by governments. Many of the improvements in chemicals and machinery are also due to research and development, particularly for herbicides and pesticides.

The Canadian Agricultural Research Council in its 1981 report *Future Thrusts* identifies that new research thrusts are needed to "stop the erosion of the agricultural and food R and D capability that has occurred over the past decade of inadequate research funding" (CARC 1981:5).

In addition, they identify "inadequacies that [have] developed at university and government laboratories over the past 15 years when capital funds were grossly insufficient" (CARC 1981:7).

To correct these deficiencies the Canadian Agricultural Research Council recommended an increase in expenditure of $270 million in constant dollars over the period 1982 to 1987. Of this amount, $200 million was identified as required for capital construction and equipment, while $10 million would be for contract research, mainly to industry. The remaining $60 million for salaries, operations, maintenance, and grants they identified as sufficient to provide, over the five-year period from 1982 to 1987, 1.2 professional positions at each of the 70 federal, provincial, and university research stations in Canada.

They also mention two other major problems: the ageing of our existing agricultural research professionals and the lack of their replacement in the university system. There is also the length of time it takes to mount research programs. They identify that "a five-year period may be required before a center of concentration can be established and a further 10 years before it becomes a center of excellence" (CARC 1981:32). None of this bodes well for the future of agricultural research and hence for future increases in yields.

The situation vis-a-vis yields and agricultural research can be summarized as follows:

1) Though everyone is in favor of agricultural research there is no sense of urgency or crisis. There has been a slow running down in our agricultural research capability over the last 15 years and it is only now that clear signs of this neglect are beginning to appear. Indeed research managers have striven mightily to do more with less and in part have succeeded.

2) The current glamour stars in the research galaxy are "high technology" industries — electronics, computers, etc. Research funds are more readily available for projects that might result in a Silicon Valley North (or West) than in an old-fashioned and rather dull industry like agriculture. There is, of course, superb science and high technology involved in agricultural research but it does not have the current patina of sophistication.

3) As evidence of this there has been no discernible action taken on the funding recommendations of the Canadian Agricultural Research Council in the four years since they were proposed.

4) Even if funds were to be allocated tomorrow the deterioration in the basic infrastructure of agricultural research has gone on so long that the rebuilding job would have to begin at the very beginning with the construction of laboratory facilities and the training of graduate researchers. Establishing this necessary foundation would take at least 10 years if we were to start on it tomorrow, and there is no indication that we will.

5) As the Agricultural Research Council notes, it would take about five years to establish a center of concentration, and 10 years to establish a center of excellence.

We start out with a lack of researchers, a lack of laboratories and facilities and, as is characteristic of Canada, with 70 research centers each of which will come forward with claims that it should be a center of concentration in something or other and each with aspirations of becoming a center of excellence. In a Canadian context it will be many years before a selection of the appropriate locations to undertake research will be made because of our long history of local, regional, provincial, and national infighting about the appropriate location for the expenditure of tax dollars.

The picture is probably brighter in Alberta than in any other location because of the infusion of Heritage Savings Trust Fund moneys through the Farming for the Future program. Helpful though it is, it is not sufficient to reverse 15 years of federal neglect of our agricultural research system all by itself.

Because of the importance of agricultural research and development to the continuing health of the agricultural industry, the Panel has identified special sources of funding, and these are discussed later in this report.

2.3 Specialty Crops

Specialty crops are usually small in volume, high in value, somewhat difficult to grow, or have an evolving management technique. Some specialty crops are introduced and grown by a few growers, develop a limited market niche, and stabilize at some reasonably steady volume. Other crops begin as specialty crops (such as canola) and go on to become major commercial crops after establishing that extensive markets are available and that the crop can be grown under a wide variety of soil and climatic conditions.

Specialty crops are a variable group, but normally they are crops requiring high heat units and ample moisture. In Alberta specialty crops are grown principally in the irrigation districts. Table 17, listing some specialty crops and some others like canola that once were specialty crops, illustrates this concentration by showing the percentage of provincial acreage to be found in Alberta's southern agricultural region, which is centered on Lethbridge. All of the sugar beets are found in this region, 76 percent of the grain corn, 95 percent of the field beans, and 69 percent of the mustard seed.

Specialty crops change rapidly. They frequently start off with a few farmers putting in 40 acres of a crop to see how it grows and whether there is any market for it. If that is successful, they will expand their acreage and others will try it out. The speed with which this can occur is illustrated in Table 18 which follows some representative specialty crops in Manitoba and Alberta from the acreage grown in 1976, grown in 1981, and forecast by provincial agriculture departments for 1984. In sunflowers, Manitoba had about 50,000 acres in 1976. This expanded by 5.4 times to 272,000 acres in 1981, and was projected to fall to 95,000 acres in 1984. For field peas, Manitoba started out with about 38,000 acres in 1976, expanded by 2.7 times to 102,000 acres in 1981, and was expected to stabilize at about 95,000 acres in 1984.

In Alberta the most spectacular expansion occurred in mustard seed, starting with about 22,000 acres in 1976, doubling to 44,000 acres in 1981, and projected to not quite double again to 85,000 acres in 1984. Manitoba more than doubled in mustard seed acreage from 1976 to 1981, but was expected to fall back by 23 percent to 35,000 acres in 1984. However, both provinces are outdistanced by Saskatchewan for the acreage in this crop; that province had 89,000 acres in 1979 and was anticipated to have 130,000 acres in 1984.

For most specialty crops Manitoba dominates the market. Comments from those knowledgeable about Manitoba agriculture (Clay Gilson 1984 pers. comm.) suggest that it is primarily due to unique combinations of individuals, growers, Winnipeg grain merchants,

Table 17. Acreage in specialty crops, 1981

	Southern Region — Lethbridge			Province	
	acres	(hectares)	% of Province	acres	(hectares)
Grain Corn	8,679	(3,512)	76.1	11,402	(4,614)
Sugar Beets	35,535	(14,381)	100.0	35,535	(14,381)
Fall Rye	118,686	(48,031)	49.2	241,416	(97,698)
Buckwheat	202	(82)	6.1	3,331	(1,348)
Flaxseed	48,891	(19,786)	47.8	102,345	(41,418)
Soybeans	6	(2)	2.2	272	(110)
Sunflowers	283	(115)	67.5	419	(170)
Canola	54,644	(22,114)	3.8	1,455,205	(588,901)
Mustard Seed	29,814	(12,065)	68.5	43,547	(17,623)
Silage Corn	21,982	(8,896)	88.2	24,937	(10,092)
Potatoes	12,366	(5,004)	74.4	16,628	(6,729)
Field Peas	5,219	(2,112)	70.4	7,409	(2,998)
Field Beans	8,428	(3,411)	95.1	8,862	(3,586)
Vegetables	8,625	(3,490)	86.6	9,963	(4,032)
Cattle on Feed	249,418		32.8	760,265	

Source: Statistics Canada (seasonal)

federal agricultural researchers, and provincial extension people. Gilson feels that there has now developed sufficient experience and infrastructure in special crops so that there are growers willing to take a chance on growing a new crop, grain merchants searching for marketing opportunities, researchers willing to modify varieties to satisfy particular markets, and provincial extension people with experience in putting the whole thing together.

For the specialty crop area in Alberta (the irrigation areas) Alberta Agriculture points out that in comparison with Manitoba, heat units in southern Alberta are not as high, the cost of production in irrigated areas is higher (the Department cites costs under irrigation as two-thirds of gross returns, while on dryland only half of gross returns are required to cover costs), the crop mix, and other special problems.

Table 18. Specialty crops: a comparison of Alberta and Manitoba

	1976 Census		1981 Census		1984 Forecast	
Crop	Alberta	Manitoba	Alberta	Manitoba	Alberta	Manitoba
			acres (hectares)			
Mustard	21,717 (8,789)	18,367 (7,433)	43,547 (17,623)	45,225 (18,302)	85,000 (34,400)	35,000 (14,200)
Sunflowers	3,557 (1,440)	49,869 (20,181)	419 (170)	271,617 (109,920)	3,000 (1,200)	95,000 (38,500)
Field Peas	7,480 (3,027)	37,831 (15,310)	7,409 (2,998)	102,411 (41,444)	15,000 (6,100)	95,000 (38,500)
Field Beans	7,830 (3,169)	7,350 (2,974)	8,862 (3,586)	19,327 (7,821)	5,000 (2,000)	10,000 (4,100)
Grain Corn	2,787 (1,128)	16,562 (6,702)	11,402 (4,614)	221,095 (89,474)	14,000 (5,700)	185,000 (74,900)
Silage Corn	26,122 (10,571)	32,612 (13,198)	24,937 (10,092)	48,711 (19,713)	30,000 (12,100)	60,000 (24,300)
Potatoes	16,218 (6,563)	34,580 (13,994)	16,628 (6,729)	40,916 (16,558)	19,000 (7,700)	40,000 (16,200)
Other vegetables	10,594 (4,287)	n/a	9,963 (4,032)	4,435 (1,795)	n/a	n/a
Buckwheat	751 (304)	43,697 (17,684)	3,331 (1,348)	126,821 (51,323)	5,000 (2,000)	90,000 (36,400)
Sugar Beets	41,883 (16,950)	33,026 (13,365)	35,535 (14,381)	28,821 (11,663)	33,000 (13,400)	28,000 (11,300)
Soybeans	313 (127)	763 (309)	272 (110)	5,681 (2,299)	n/a	n/a

Source: Statistics Canada 1982a, 1982b for 1976 and 1981 data; Statistics Canada Seasonal, Vol. 63 (8), for 1984 forecasts

However, one of the major reasons for the disparity is the concentration of production in the irrigated areas of what in fact is a specialty crop, even though it is one of the major commercial crops grown on the Prairies. This is wheat, specifically, soft white spring wheat, which has exceptional yields under irrigation in southern Alberta. Though soft white wheat is marketed through the Canadian Wheat Board, it has specialized foreign markets since it is not best suited for normal bread-making.

The acreage under soft white wheat in Alberta has expanded from 230,000 acres in 1981 to about 450,000 acres in 1983, almost exclusively grown under irrigation. Since the same equipment for planting and harvesting normal grain crops can be used for soft white wheat and with average yields of 70 bushels per acre possible, it is an extremely attractive crop, and in almost every sense is the specialty crop of the irrigated areas.

Given these disadvantages and alternatives, it does not seem likely that Alberta will be challenging Manitoba in specialty crops like grain corn, sunflowers, or field peas, or in emerging specialty crops such as soy beans.

It is impossible to forecast what the specialty crops of 2010 are likely to be or how many acres will be required. What is likely is that Manitoba will still provide the bulk of specialty crops since the advantages of additional heat units and lower costs are enduring. Even the addition of more irrigation acreage would not change this picture, unless for some reason, as happened with mustard seed, Manitoba growers and marketers did not grasp a specialty crop opportunity. Soft white wheat and feeder crops such as alfalfa and barley will continue to dominate irrigated acreage since they have comparative advantages in southern Alberta as well as excellent markets.

2.4 Marketing Boards

Marketing boards have been established to improve the producer's ability to market his product at a price that covers the cost of inputs and provides a return to management. The consumer benefits from improved security of supply, assured quality, and protection from excessive price fluctuations. Marketing boards have varying powers and approaches to this objective, from an educative, publicity, and purely promotional function to marketing boards with full supply management. Veeman and Veeman (1980) have characterized marketing boards as outlined in Table 19.

The major change in the nature of marketing boards occurs when they move to control supplies. With promotion, negotiation, and even centralized selling it can be argued that what is occurring is that the marketing function is being performed more effectively, though centralized selling is a major step toward control. Once supply management is included as a marketing board function, the normal relationships of supply and demand are inhibited.

The most difficult problem is that quotas tend to acquire value. Quota values on resale are capitalized into the sale price of the enterprise, and though there have been many attempts to eliminate quota values, none of them have succeeded. New entrants are forced to pay the capitalized quota value and therefore establish a new and higher cost of production for the supply-controlled product.

Table 19. Different types of marketing boards

Type of Board	Major Activities	Examples
(1) Educational and promotional boards	Levy producers and conduct or sponsor promotion, research, and information activities	Alberta Cattle Commission Alberta Potato Commission Alberta Sheep & Wool Commission
(2) Negotiating boards	Negotiate producer price and terms of sale	Alberta Vegetable Grower's Marketing Board
(3) Centralized selling boards	Sell all of the product	Alberta Pork Producers' Marketing Board
(4) Centralized selling boards with power to control supplies	Control supplies through production or marketing quotas; may determine producers' prices	Alberta Dairy Control Board Canadian Dairy Commission Canadian Egg Marketing Agency Canadian Turkey Marketing Agency

The importance of this feature of supply management is that the supply-managed commodity is no longer capable of competing on the international commodity market, except through the disposal of surplus stocks that accumulate because of the inability of the marketing board to match domestic supply and demand with the precision of the free market.

With respect to those commodities under supply management, such as dairy products, eggs, and poultry, the producing sector has essentially elected to limit its future markets to domestic demand. Domestic demand does not mean even the Canadian market but essentially a provincial market since quotas are characteristically established on a provincial basis. Expansion in these supply-managed commodities will only occur in pace with population growth and, to a lesser extent, income increases.

There are substantial attractions to partaking in such sheltered production enclaves. A moderate management and production effort will result in a moderate, but reliable, income level. What is of concern is that there is a tendency of supply management boards to spread both geographically and by commodities. They are particularly attractive for provinces that have little comparative advantage in production. They are therefore frequently used to achieve import substitution, often through subtle non-tariff barriers such as unique packaging or labelling requirements or excessive health standards.

An example is the development of hog production in Quebec. Quebec was once a major market for Alberta pork; however, the Quebec government adopted an import substitution program for pork with a number of very attractive assistance programs for Quebec hog producers. The result is that Alberta producers are no longer competitive in this market. In retaliation there is a tendency to advocate increased provincial protectionism, including stronger support programs and marketing powers, not as a preference but as a protection against further erosion of markets. Alberta farmers have been reluctant to go this route, having faith in the free market system and a belief in their ability to grow food cheaply in competition with anyone else, as long as they are competing on even terms of access to markets and levels of subsidy.

The Alberta farmers' instincts are correct. Once a supply management marketing board is adopted and the quota values become built in, the supply-managed producer becomes a high-cost producer, unable to compete in international markets. International markets then become mainly the occasional dumping ground for surplus products.

For those products under supply management, forecasting is essentially the projecting of future provincial population growth. However, there is also a tendency for non-controlled sectors, attracted by the artificially high prices, to search for and frequently find alternate or substitute products. This is illustrated in the case of dairy products by the increasing market share of margarine and coffee whiteners.

Markets for commodities such as poultry, eggs, and dairy products can be expected to increase at no more than the rate of provincial population growth. For Alberta, the Alberta Bureau of Statistics has recently predicted that population will increase from 2.24 million in 1981 to 3.45 million in 2010, an increase of 1.5 percent compounded for the period. This estimate is much below earlier estimates of the late '70s that were overly influenced by the province's overheated economy.

2.5 Red Meat Markets

2.5.1 Cattle

The cattle market is a complicated one with different sectors facing different prospects and influences. The cow/calf segment of the industry is based primarily on the low-cost grass of the prairies and the foothills. It sells to either domestic feeders or eastern feeders. Though prices tend to fluctuate substantially, there is a tendency for a relatively constant level of production based on the availability of grass, the carrying capacity of pasture, and the size of the hay crop. The major adaptation is whether heifers are bred or slaughtered. If the expectation is for rising prices, heifers are bred; if for lower prices, they are fed and slaughtered.

Feeder cattle represent the remainder of the beef production industry in Alberta. Since about 1965, custom feedlots have increasingly replaced the farm feedlot. When feed grain is cheap and supplies abundant because of lack of export grain sales, finished beef can be produced cheaply on the Prairies. When feed costs are relatively low, beef prices are also low and domestic consumption tends to increase. There is no doubt that beef is a preferred food item, but because of its central place in food consumption and its tendency to be the most expensive single item on the shopping list it tends to attract greater consumer scrutiny than any other item. When beef prices seem reasonable (in comparison with alternative foods) consumption remains high; when beef prices get ''out of line'' consumption is reduced. Because of the length of time that it takes to expand beef herds this price sensitivity tends to exacerbate the beef cycle, which is the name given to the tendency to overshoot market signals at regular intervals.

The long expansion of the cattle market that occurred up to 1974 depended partly on population and income expansion (which meant that more people were able to afford beef) but equally on the ample and cheap supplies of feed grain which kept beef a food bargain.

Since 1974, populations and incomes have continued to grow but the generally strong feed grain export markets have meant few bargains in feed grains, and therefore ''cheap'' beef has only been available at times in the beef cycle when growers had surpluses.

There is another aspect to the market — beef imports. One of the strongest segments of the beef market has been fast foods, dominated by hamburger. There is a preference in this growing market segment for grass-finished beef. This is partly due to price since these animals tend to originate on low-cost grass in Australia, New Zealand, and Argentina, but flavor and leanness are also factors.

Export markets are available for our grain-finished cattle in the US and Japan. We are competitive in the US market and indeed our exports tend to get halted by the utilization of the annual quota late in the year rather than by the fact that markets are not available. In Japan the major problem is the competition from US meat processors and with the clout of America, the Japanese are not likely to favor the Canadian product. Export markets have tended to act as adjustment mechanisms for the domestic market rather than as markets in their own right.

In any event, as seen by Table 20, Canada has rarely been self-sufficient in cattle.

Table 20. Canadian imports and exports of beef

Year	Beef Imports		Beef Exports		Net Imports	
	millions of pounds	(millions of kilograms)				
1961-65 average	30.4	(13.8)	47.2	(21.4)	−16.8	(− 7.6)
1966-70 average	87.2	(39.6)	81.6	(37.0)	5.6	(2.6)
1971	150.8	(68.4)	107.1	(48.6)	43.7	(19.8)
1972	196.7	(89.2)	85.5	(38.8)	111.2	(50.4)
1973	214.2	(97.2)	85.6	(38.8)	128.6	(58.4)
1974	174.8	(79.3)	51.6	(23.4)	123.2	(55.9)
1975	200.5	(91.0)	44.4	(20.1)	156.1	(70.9)
1976	311.7	(141.4)	128.5	(58.3)	183.2	(83.1)
1977	191.7	(87.0)	111.8	(50.7)	79.9	(36.3)
1978	215.1	(97.6)	98.3	(44.6)	116.8	(53.0)
1979	183.4	(83.2)	114.7	(52.0)	68.7	(31.2)
1980	172.6	(78.3)	143.3	(65.0)	29.3	(13.3)
1981	174.4	(79.1)	174.6	(79.2)	− 0.2	(− 0.1)
1982	191.2	(86.7)	182.4	(82.7)	8.8	(4.0)

Source: Statistics Canada (annual)

There is no obvious reason for this persistent long-term shortfall. We could, if we wished, produce every type of cattle including grass-fed. Indeed, in observing the long-continued deficit position, one would be forced to conclude that a supply-managed marketing board coupled with rigid import quotas might be attractive to producers. It would not be in the consumer's interest any more than poultry marketing restrictions are. However, in spite of calls for marketing boards from the federal level and in spite of the gradual closure of the Quebec market to Alberta cattle, the Prairie cattlemen have resisted the enticements of supply management. There has, however, been a noticeable erosion of their position in the last decade and they are presently willing to accept stabilization schemes that would have been anathema a short time ago. They do so not because they are supportive of such schemes, but purely as a matter of self-defence to protect themselves from support schemes in other provinces.

The cattle market is so complex and interconnected that the best intentions of governments, whether federal or provincial, Quebec or Alberta, are usually counter-productive. Subsidies are always at the expense of the consumer whether through higher prices or higher taxes. What is less appreciated are the disadvantages to the ranching or feed industries that governments ostensibly are trying to help. These usually take the form of over-expansion to take advantage of cheap pasture, subsidized feed prices, or distorted transportation costs and a consequent excessive collapse at the next phase of the cattle cycle, followed by calls for additional government assistance.

Alberta cattlemen are generally aware of a number of these facts as evidenced by their testimony at the public hearings:

1) That government assistance, by whatever level, is usually counter-productive.

2) That Alberta has natural advantages which, in the absence of government interference, would give it a consistent and possibly growing share of the Canadian market.

3) That although the Alberta industry is able to compete in certain segments of the export market, it cannot be as strong in these markets as it is within Canada. It will have to accept the Chicago price for cattle, sometimes to its advantage, at times to its disadvantage. Frequently the ability — or inability — to compete externally depends on the international competitive capability of the packing house industry, not on the primary cattle industry.

4) Though Alberta cattlemen, confident of their ability to compete, would prefer an open and essentially unsubsidized market within Canada, this is not likely to occur if:

    a) Quebec provides subsidies or protection to its local cattle industry which will displace some Alberta cattle from the Montreal market.

    b) The federal government maintains:
        i) feed freight assistance to the benefit of eastern feeders;
        ii) a grain export transportation differential to benefit the more numerous Prairie grain growers, rather than the fewer cattlemen;

iii) import controls to protect high-cost eastern feeders from international competition, resulting in closed or impeded international (US) markets for Alberta beef.

The result will be that Alberta's future markets for red meat will not depend on cheap grass, cheap grain, skilled ranchers, or competitive packers but on the political clout of Alberta in the counsels of the federal government and individual provincial governments.

In the future it is probable that other provincial governments will make decisions that they believe will be to the advantage of their local cattle industry. These will usually be in the direction of greater provincial support to local industry, primarily limited by their ability to pay. These actions of the consuming provinces will frequently be supplemented by federal support such as feed freight assistance, import controls, or grain export subsidies.

However, it is important that Alberta devote special efforts to resisting the drift into an export grain and oilseed agricultural economy. The cattle industry is not only important in its own right but is a principal method of marketing grasses and forages which will be essential to maintain the long-term quality of Alberta's land base (see Section 2.6). Current market trends indicate a bouyant future market for grain and oilseeds and a constrained and difficult market for beef.

2.5.2 Pork

Many of the market characteristics of cattle are repeated in an exaggerated fashion in hogs. Since pigs can be raised on a pure grain ration after weaning, access to pasture does not constitute an advantage. With feed grain freight assistance and local supplies of corn along with generous provincial assistance programs, Quebec has been transformed from a pork deficit area to a pork surplus area.

Table 21 indicates that western Canada is barely self-sufficient in hogs. As can be seen, western Canadian consumption varies from 5.4 percent below production to 2.8 percent over production. In a supply-managed market that would be considered good targeting. Export markets, whether to the US, eastern Canada, or Japan, have to take only a small portion of western production to clear the market.

There are potential export markets, particularly in Japan and the US, for Alberta pork. They have been pursued vigorously, but only another long-continued grain surplus would make raising hogs for export markets attractive to large numbers of farmers on a continuing basis.

The adoption of the single selling desk by the Alberta Pork Producers' Marketing Board is the closest possible step to supply management. By 2010, it is expected that hog producers will have taken the final step to supply management and that the growth of the Alberta hog market will be governed by the rate of population increase in the four western provinces.

Table 21. The relationship between estimated pork consumption and hog production* in western Canada

	1979		1980		1981		1982	
	Consumed	Produced	Consumed	Produced	Consumed	Produced	Consumed	Produced
	(number of hogs in thousands)							
Manitoba	513	1,024	559	1,172	544	1,167	486	1,131
Saskatchewan	480	644	529	740	515	654	461	567
Alberta	1,016	1,406	1,149	1,629	1,203	1,581	1,096	1,528
BC	1,294	140	1,448	261	1,416	339	1,316	324
Total	3,303	3,214	3,685	3,802	3,678	3,741	3,359	3,550
Surplus or Deficit	– 89		+ 117		+ 63		+ 191	
Surplus or Deficit as % of Production	2.8 %		3.1 %		1.7 %		5.4 %	

*Carcass weight is assumed to be 131 pounds (59.4 kilograms)

Source: Canada West Foundation Task Force 1980: Table 12-6 Updated

2.5.3 Lamb and Mutton

Canadians eat very little lamb and mutton, about two pounds per capita per year, compared to about 48 pounds of chicken, 58 pounds of pork, and 105 pounds of beef per person. Again, though it is perfectly possible to grow all the sheep meat we eat, we do not do so, importing most of what we consume from overseas, particularly New Zealand. Lamb has not been an attractive product for Canadian producers, and there is no reason to expect any change in levels of production in the future.

The problem with lamb is not one of markets but an inability to produce in spite of substantial government assistance in Alberta. There were about five times as many sheep and lambs on the Prairies in 1935-39 as there were in 1978 (1.2 million vs. 260,000), and if trend lines were to be followed we would be out of sheep, except for hobby growers, by 2010.

2.6 Discussion

The market outlook for the long term for wheat, coarse grains (primarily barley), and canola is bright. For Canada as a whole the following export levels are anticipated for the year 2010:

Table 22. Forecast of Canadian grain and oilseed exports for 2010

Wheat	42.0	million tonnes
Coarse Grains	19.0	million tonnes
Canola	5.0	million tonnes

Source: Tables 10, 11; Section 2.1.5

For domestic consumption the following estimates have been developed:

Table 23. Forecast of domestic consumption of grains and oilseeds for 2010

Wheat	7.2	million tonnes
Coarse Grains	13.9	million tonnes
Canola	1.2	million tonnes

Source: Section 2.1.6

In total, there is an anticipated demand for the following volumes by 2010:

Table 24. Forecast of total market for grains and oilseeds in 2010

Wheat	49.2	million tonnes
Coarse Grains	32.9	million tonnes
Canola	6.2	million tonnes

Source: Derived from Tables 22 and 23

Alberta's share of this demand based on the historic record is estimated as follows:

Table 25. Alberta's share of forecast market for grains and oilseeds in 2010

	Total Market (millions of tonnes)	Alberta's Share %	Alberta's Share (millions of tonnes)
Wheat	49.2	26	12.8
Coarse Grains	32.9	55	18.1
Canola	6.2	44	2.7

Source: Total market from Table 24, Alberta's share (%) from Section 2.1.7

The table below provides the level of production in Alberta in 1983 in comparison with the estimate for 2010:

Table 26. Production compared with forecast markets for Alberta grains and oilseeds

	Actual Production 1983 (millions of tonnes)	Estimated Market 2010 (millions of tonnes)	Annual Growth Rate in Demand 1983 – 2010 %
Wheat	6.8	12.8	2.37
Coarse Grains	6.3	18.1	3.99
Canola	1.1	2.7	3.38

Source: 1983 production from Alberta Agriculture 1984a; estimated market 2010 from Table 25

As can be seen, there is a substantial increase in the demand for wheat, coarse grains, and canola over the longer term in Alberta. Some of this future demand can be met by increases in yields. Table 27 shows two forecasts of the acreage requirements in the year 2010 for these commodities. The acreage figures are based upon meeting the Alberta markets estimated in Table 25. The optimistic forecast assumes that yield increases which have occurred on stubble will continue up to 2010 at the same rate that occurred from 1958 to 1982 (see Section 2.2 and Table 16). Similar assumptions are made for the moderate forecast, except that yield increases for fallow seeding are used.

In the case of wheat, it can be seen that under both scenarios the land base need not be increased and that in the optimistic case the land requirements actually drop by more than two million acres. The moderate growth rate increase results in an acreage the same as at present.

Table 27. Forecasts of acreage required for grains and oilseeds

	1983	Optimistic Yield Growth Rate Forecast 2010	Moderate Yield Growth Rate Forecast 2010
		(million acres seeded)	
Wheat	7.7	5.2	7.7
Coarse Grains	6.3	7.1	9.2
Canola	2.5	2.5	3.5
Total	16.5	14.8	20.4

Source: 1983 acreage from Alberta Agriculture 1984a; forecasts derived internally

Coarse grains require a larger land base under both the forecast assumptions. In the moderate case, about three million additional acres are required, and in the optimistic case only about three quarters of a million acres increase is estimated. An optimistic yield growth forecast enables a land base similar in size to that of 1983 to meet 2010 market demands for canola. The moderate yield increase expectation requires an additional million acres to provide the same amount of oilseed.

If the crop acreage requirements are aggregated, the land base demands are increased by about four million acres by 2010 for the moderate scenario, but actually drop by nearly two million acres if the most optimistic estimate of growth in yields is accepted.

A pessimistic scenario might assume growth in grain and oilseed yields at no more than those achieved by tame hay historically.

The conclusion is that unless one is optimistic about the potential for yield growth rates and the relative cost increases in the inputs necessary to achieve such rates, more land will be required in the future if grain and oilseed crops are going to fill available markets. Much of this demand would be met by clearing presently unimproved land and by breaking land presently in pasture and range.

This would be particularly true if markets for beef cattle were to remain steady or decline over the next 25 years. As was noted this is a very real possibility, not because Alberta is not competitive in raising beef but because of restrictions, particularly government restrictions, or indirect barriers, to the natural markets for Alberta beef.

A combination of bouyant markets for grains and oilseeds and a stagnant market for beef could lead to problems for Alberta's agricultural land base. Many areas presently in grass should remain that way because alfalfa and other forages have substantial beneficial effects on soil quality. However, it is not enough to identify the important role that grasses and forages play in the maintenance or restoration of the health of the soil. The farmer must also be able to use these crops at some profit to himself. The principal method of marketing grass and forages is by means of cattle. The forage requirements for dairy cattle are expected to expand only moderately, in line with provincial population growth. However, a substantial expansion of beef production would be possible if market barriers, direct and indirect, could be removed or lowered. Therefore the Panel makes the following recommendation: "that the Government of Alberta work toward the removal of all inter-governmental barriers to free trade in beef, whether at the feeder cattle or finished stage. Particular attention should be paid to indirect barriers, including excessive levels of subsidy to develop beef cattle industries.

If, after fully canvassing the potential for free trade in beef at the provincial, national, and international level, the conclusion on potential expansion is negative, the Government of Alberta should institute special beef marketing programs. These might include special transportation assistance to market beef in new market areas, additional research on new forms of beef products, packaging, processing, transportation, and storage, and continuing follow-up and reassessment of existing programs and initiatives."

In addition, certain forage products can be marketed directly outside the province either as special feed (alfalfa cubes and pellets) or as forage and grass seed. Such production permits a valuable alternative method of providing the benefits of grasses and forages to soil quality without having to be processed through a ruminant. This is particularly important in the Peace River country, which has disadvantages of distance from markets in developing a strong livestock industry but needs the addition of grasses and forage to improve the fiber content of Grey Wooded Soils. In these instances, special marketing programs for forage and grass products are warranted as outlined in the following recommendation: "export marketing of grass and forage products should involve product-oriented task groups representing each element in the chain from producer to consumer."

The marketing task group would bring together, for a specific product, representatives of each of the major stages from producer to consumer. For example, for a product such as sweet clover seed the resources might consist of:

a) Marketer — someone with contacts in world markets who could identify which countries use sweet clover seed, in what amounts, and for what purposes; their special requirements as to germination rate, cleanliness, packaging, etc.

b) Alberta Agriculture — to identify the areas which could grow sweet clover most effectively and to establish management practices for sweet clover, for example for seed bed preparation, fertilization, chemical treatments, management, harvesting techniques, equipment required, etc.

c) Researcher — to develop varieties to meet market requirements and improve yields, or to develop or modify management practices and equipment.

d) Packaging and Transportation — if there are any special requirements for storage, packaging, and transportation, a packaging and transport specialist might be required on the task group or could be brought in as necessary.

e) Manufacturing — if the product were one that went through a manufacturing process, a representative of the manufacturer should be present to speak to questions of standards, quality control, volumes, and profit margins.

f) Farmer — a representative of farmers who were interested in growing the crop, probably on a contract basis. He would provide insights on the problem of actually growing the crop with existing or adapted equipment.

g) Extension Services Branch, Alberta Agriculture — would be responsible for interesting a sufficient number of farmers in growing the crop so that there would be enough product to demonstrate to potential customers the qualities and special characteristics of Alberta sweet clover seed.

The first step would be the identification of a product that seemed to have some demand in world markets and can be grown in Alberta. Sweet clover has been used in this illustration. It is intended as an example and not as a suggestion, though this product might well be worth further examination, since Alberta grows only about one-tenth of the sweet clover seed produced in Manitoba. The advice of those knowledgeable in the market would be critical in identifying potential target products.

The marketing task group would be a mixed government-private group. A principal function would be to try to bring government programs, knowledge, and services to the service of the private sector in marketing, manufacturing, transporting, or growing. The government commitment should be for only a limited time period.

Funding for such market development projects might initially be developed under the Farming for the Future program, since this program would be experimental and developmental.

A similar approach could be applied to other specialty crops (such as pulse crops) that may have a role as soil amendments, and could be introduced into Prairie grain rotations.

2.7 Institutions

The Panel received many comments at the hearings about the behavior of institutions (primarily provincial institutions) and the effects of that behavior on the agricultural land base.

Lack of co-ordination between the various agencies involved with agricultural land use was a common complaint (30, 65, 76, 102, 116, 137, 150, 163, 168, 187, 195, 223, 251, 253, 254, 264), and several presenters suggested that more co-operation should be encouraged (59, 70, 154, 237, 254, 264). Despite attempts by agencies such as Alberta Agriculture and Alberta Transportation to co-ordinate some of their activities, the public perception is that they are unsuccessful. The perception exists even though agencies like Alberta Agriculture provide input to both public and private land use planning processes at many different levels, from the local forest superintendent or regional planning commission offices to the Alberta Planning Board, and interdepartmental committees exist to review activities such as reclamation following surface disturbances.

Some hearing participants criticized a lack of commitment and subsequent action on the part of provincial agencies to protect agricultural land (30, 65, 102, 172, 186, 195) and suggested that Alberta Agriculture become more involved in land use decision-making and in agricultural land protection (30, 44, 198, 224, 229, 231).

Some comments were made about the various institutions involved in land use activities that affect agricultural land. The Energy Resources Conservation Board (ERCB) was urged to pay more attention to the quality of agricultural land in setting target areas for oil and gas wells (94, 99). Alberta Environment was praised for some aspects of its water programs, particularly flood protection (124) and drainage (124, 254), but criticized for bureaucratic problems with other aspects (62, 86, 173, 198). Providing large government subsidies for irrigation without comparable assistance for dryland farmers was criticized (37). An increased role for the Northern Alberta Development Council in recommending alternatives to protect agricultural land was suggested (123). The Alberta Housing Corporation was criticized for land-acquisition activities that were not co-ordinated with other agencies' activities and drove up land prices (96, 102). Alberta Transportation's activities in planning roads were both praised (4) and criticized (55, 102, 251), and the department was encouraged to give more consideration to agricultural land quality and use (70, 94, 192).

Hearing participants commented extensively on planning activities that affect agricultural land. The Alberta Planning Board was described as interfering in regional and local planning, being inconsistent in hearing subdivision appeals, and thwarting regional and local efforts to protect agricultural land despite its new policies designed specifically to give greater power to local municipalities (42, 96, 150, 182, 225, 237, 238, 241); nevertheless, these new policy efforts of the Alberta Planning Board were acknowledged and supported (136). The efforts of Alberta Energy and Natural Resources to develop integrated resource plans for public lands were supported by some (8, 137, 139, 163) but criticized for the length of time required to prepare integrated resource plans and to transfer public lands to private use (2, 101, 139, 212) and for having a bias towards forestry (22, 113). The provincial Cabinet was urged to treat provincial, regional, and local levels consistently when making decisions on annexation applications (224). Having provincial government departments adhere to a provincial land use policy and be subjected to exactly the same planning processes as non-government developers was also suggested (102, 254). The Local Authorities Board was criticized for requesting that municipalities apply to annex enough land for up to 40 years (42) and for not directing annexations towards poorer quality land (65).

A number of comments were made that Alberta Agriculture, the Agricultural Service Boards, and the Agricultural Development Committees should put increased priority on soil conservation through, for example, research and education (24, 104, 115, 180, 224).

Criticisms were made of the reclamation activities of the Land Conservation and Reclamation Council (169), the ERCB (178), and Alberta Transportation (94); the suggestion was made that Alberta Agriculture should be more involved in reclamation (44), while another presenter stated that the present system would be adequate if adhered to (44, 108).

Environmental considerations generated only a few comments related to the activities of particular agencies. It was suggested that Alberta Environment should pay more attention to pollution problems and to obtaining and responding to public input on those problems (30, 70, 217). The Fish and Wildlife Division of Alberta Energy and Natural Resources was criticized for taking a confrontational approach to interactions between wildlife and agriculture (116), for not releasing data on game populations (116), for being slow to remove problem beavers (120), and for not getting public input (121). More co-ordination between departments dealing with environmental matters that affect agriculture was urged (116, 253).

In activities related to production and economic return, the Alberta Agricultural Development Corporation was both praised and criticized for its programs (3, 136).

The preceding illustrates the range of commentary on the effect of institutions on the land base. The complexity of institutional arrangements is substantial and the next section illustrates that.

2.7.1 Complexity of the Institutional Framework

Government institutions operate a plethora of programs at all levels. The activities under these programs can have direct or indirect effects on the agricultural land base and its use. The effects of programs can be positive, neutral, or negative and the programs can operate in complementary, synergistic, or antagonistic patterns. Existing government programs have reached a level of complexity which makes judgments about the implications to agricultural land very difficult.

The Panel met with representatives of the federal Department of Agriculture. This department is involved in the administration of 43 Acts (see Appendix C).

Departmental representatives were able to identify 118 federal programs which have affected agriculture and, consequently, agricultural industry decision makers between 1970 and 1982 (see Appendix D). Those 118 programs spanned at least eight departments. Table 28 presents their estimated expenditures related to agriculture in 1982.

During 1982 about $250 million or 13 percent of total federal agricultural expenditure was spent in Alberta on some portion of 118 programs. In that same year Canadian farm cash receipts were $18.8 billion of which $3.8 billion or 20 percent originated in Alberta (Alberta Treasury 1984a).

The provincial government also has a large institutional presence in agriculture. The best way of illustrating the complexity of provincial programs relating to agricultural land is to identify some of the legislation expected to have an impact on the land base. That impact can occur directly (for example, the Weed Control Act) or indirectly, through a program which affects one or more of the markets where the agricultural industry operates. The relevant provincial Acts are identified in Appendix E. The legislation is distributed as is shown in Table 29.

Table 28. Federal government expenditures on agricultural programs

Federal Department	National Level	Alberta Level	Alberta as % of National
	(dollars in thousands)		
Agriculture	1,107,211	129,675	11.7
Employment and Immigration	15,148	686	4.5
Environment	494	157	31.8
Indian Affairs and Northern Development	6,453	841	13.0
Industry, Trade and Commerce	152,728	31,178	20.4
Regional Economic Expansion	89,929	5,361	6.0
Ministry of State for Science and Technology	4,718	207	4.4
Transport	352,078	79,376	22.6
Subtotal	1,728,759	247,481	14.3
Other and Unallocable	240,408	0	0
Total	1,969,167	247,481	12.6

Source: Agriculture Canada 1984b

Table 29. Provincial departments responsible for legislation affecting the agricultural land base

	Number of Acts Expected to Affect the Agricultural Land Base
Agriculture	48
Environment	12
Energy and Natural Resources	9
Municipal Affairs	6
Energy Resources Conservation Board	5
Attorney General	2
Housing	1
Recreation and Parks	1
Social Services and Community Health	1
Consumer and Corporate Affairs	1
Treasury	1
Transportation	1
The Premier	1
Total	89

The 48 Acts administered by Alberta Agriculture are supported by 168 sets of gazetted regulations, which have been subject to 233 amendments as of December 31, 1983. The following identifies some of the most prominent of these:

Table 30. Regulations and amendments to major agricultural legislation (Alberta Agriculture)

	Number of Regulations	Number of Amendments to Regulations
Marketing of Agricultural Products Act	46	107
Department of Agriculture Act	26	34
Livestock and Livestock Products Act	17	7
Seed Control Areas Act	14	3
Agricultural Pests Act	11	4

Other active legislative areas that are relevant to agricultural land, but not in the Department of Agriculture include:

Table 31. Regulations and amendments to major agricultural legislation (other departments)

	Number of Regulations	Number of Amendments to Regulations
Planning Act	38	123*
Public Lands Act	39	25
Land Surface Conservation and Reclamation Act	12	24

* mainly time extensions

All provincial government programs take place under the authority created in the legislation. Some of these programs are listed in Table 32. The portions of the budget for these programs which can be clearly allocated to the agricultural sector are not easy to determine, as the data are not intended to be aggregated that way. Those portions that can be identified are:

Table 32. Provincial budget allocations for agricultural programs

		1984-85 Estimates
Department of Agriculture		
Departmental Support Services		$ 15,384,373
Production Assistance		$ 32,177,380
Marketing Assistance		$ 14,535,656
Field Services		$ 30,816,775
Research and Resource Development		$ 12,208,295
Hail and Crop Insurance Assistance		$ 9,042,000
Agricultural Development Lending Assistance		$ 80,412,000
	Subtotal	$ 194,576,479
Department of the Environment		
*Surface Water Development and Control		$ 14,938,763
*Operations and Maintenance of Water Resources System		8,010,338
	Subtotal	$ 22,949,101
Department of Energy and Natural Resources		
*Public Land Management		$ 19,422,408
	Subtotal	$ 19,422,408
	Total	$ 236,947,988

*not all can be allocated to agriculture

Source: Alberta Treasury 1984b

The level of activity apparent in one legislative area when compared with another may not be an indication of its impact on the agricultural land base. Similarly, budget allocations may or may not indicate a situation with considerable effects on agricultural land. As an illustration, Order in Council 113-48 under the Provincial Lands Act and Ministerial Order 26/68 under the Public Lands Act (establishing the Green, Yellow, and White Areas) set the boundaries for agricultural development in the province. These were Orders rather than Acts and had no clear budget implications, but have profoundly affected the present distribution of Alberta's agricultural industry.

Other government activity which substantially affects the agricultural land base is decision making at the regional planning commission and municipal government levels. Another local-level institution, the Agricultural Service Boards, also has an impact.

Regional planning commissions and municipal councils have regulation-making authority derived from provincial legislation. They have substantial interest in and influence upon local land use decisions. Municipal governments were second only to individuals in the number of briefs presented at the hearings, and all regional planning commissions participated. (There were 40 presentations from municipal governments and 10 from the regional planning commissions).

The regional planning commissions are established under the authority of the Planning Act. Each commission consists of elected officials from the various municipal jurisdictions in the region. Their activities are supported by a technical staff consisting primarily of planners.

The commissions' major roles are to prepare regional plans for their regions, to assist member municipalities with their plans and land use bylaws, to encourage public participation in planning, and to comment on proposed annexations. They are also the subdivision approving authority for most municipalities in their region. In some cases the Minister of Municipal Affairs has delegated this authority to the municipal level.

Considerable authority exists at the municipal level of government. The major regulatory tools are the issuance of development permits by the development officer and the establishment of land use bylaws. At this level, there can also be a municipal planning commission, established by municipal councils. The prime role of the commission officials is to make decisions on development applications.

The other important institution at the municipal level is the Agricultural Service Boards. These Boards are created by the Minister of Agriculture. Members come from the municipal council, the ratepayers of the municipal district, and from the Department of Agriculture. The duties and responsibilities of the Boards are defined in the Agricultural Service Board Act. They include:

a) to act as an advisory body and to assist the local council and the Minister of Agriculture in matters of mutual concern;
b) to advise on the organizing and directing of weed control and soil and water conservation programs;
c) to assist in the control of livestock disease under the Livestock Diseases Act;
d) to advise with respect to and to assist in proper land utilization with a view to improving the economic welfare of the farmer and;
e) to promote and develop agricultural policies to meet the agricultural needs of the municipality.

The authority that exists to implement these responsibilities is extensive. If progressive steps fail, the Board can recommend to council that the control of land be taken away from the owner and occupant and that an order of reclamation be issued by the council. These recommendations are then implemented through a bylaw. Alternative implementation procedures exist for Improvement Districts and for the Special Areas. There is a system for appeal to the Court of Queen's Bench. Hence there is now a system in place with the authority and mandate to deal with many of the concerns presently facing our agricultural land base.

The effectiveness of the Agricultural Service Boards has likely been curtailed by several realities. There is no obvious base of public and political support for their activities. Second, there does not appear to be a readily defined regional or provincial information base to support decisions which must be made. Third, some of the tools which the Boards can use seem out of scale to the problems being addressed and, fourth, the Boards may be underfunded.

The above distribution of powers coincides with the direction given to regional planning commissions and municipalities by the Alberta Planning Board and the Minister of Municipal Affairs. Alberta Planning Board documents in recent years have emphasized local decision making and regulatory systems. For example:

> *A major role of a regional plan is to provide criteria for the identification of better agricultural lands. Once the criteria are in place, it is the municipalities' responsibility to ensure that better agricultural lands are conserved. For this reason, the Framework document directs regional plans to make it mandatory for municipalities to protect better agricultural land in their general municipal plans and land use by-laws. Additional reinforcement is provided by the Planning Act which requires that every municipal planning instrument be in conformity with the regional plan affecting that municipality.* (Alberta Planning Board 1984: 10)
>
> *In applying the guiding principle 'wherever alternative courses of action are reasonably available,' it is the Board's view that municipalities are in the most advantageous position to make the necessary trade-offs because they have the closest association with the issues that are involved.* (Alberta Planning Board 1984: 12)

2.7.2 Discussion

The institutional systems surrounding the agricultural industry have reached a level of complexity such that it is difficult to predict the impact of further institutional arrangements on the agricultural land base. Predictability is likely to occur only where very clear direction and accountability can be established.

The institutional arrangements Alberta requires to expand and maintain the agricultural land base and a viable agricultural industry must reflect the market situation described in earlier sections of this report; that is, that our agricultural producers participate in both regional supply management systems and in the international marketplace.

The land base needed for supply-managed commodities is tied to present and future population levels, and the impact that research activities might have on yields. In this situation returns to producers are often set as an increment of overall production costs and land is simply one of those costs. In many ways the supply management producer is isolated from full market competition and profit maximization comes about from minimizing input costs. Investments to improve land quality are reasonably secure because product price is predictable and can be adjusted by regulatory systems as required. Perhaps, as with the Land Commission approach in BC, it is also a situation where the consequences of institutional intervention can be predicted.

Agricultural producers who compete in the international marketplace face a very different situation. They are price takers in markets of considerable uncertainty. Land costs are a major input to their operations, particularly for those who have begun business in the last decade. In addition, the price and volume instabilities of the international marketplace make long-term decision making difficult, often to the detriment of soil quality (see Section 3.3).

In terms of the land base per se, no agency exists which is responsible for monitoring the status of the agricultural land base from a provincial perspective. No single organization has been specifically identified as responsible for the maintenance, conservation, and enhancement of the agricultural land base despite the numerous agencies which have a concern for or a relationship with the land base.

A provincial responsibility center would provide this as well as an indication of the provincial government's commitment to the maintenance, conservation, and enhancement of the agricultural land base. Its objective would be the development of a continuing and evolving policy that reflects the importance of the agricultural land base to the people and government of Alberta. With the intention of providing for a balance between individual rights and the necessity to conserve our agricultural heritage for future generations, the Panel makes the following recommendation, with details described below.

It is recommended that "an Agricultural Resources Conservation Board be established, reporting to the Minister of Agriculture and charged with the responsibility on behalf of the Government of Alberta for the conservation, maintenance, and enhancement of the agricultural land base."

The Agricultural Resources Conservation Board (ARCB) should be provided, through appropriate legislation, with an advisory, educational, leadership, co-ordinating, and audit role in the following areas:

a) the utilization of agricultural land for non-agricultural purposes;

b) the conservation, management, enhancement, expansion, and utilization of agricultural land;

c) the prevention and control of all forms of soil degradation and the reclamation of degraded soils;

d) the planning of industrial, urban, and government infrastructure that will affect the agricultural land base;

e) economic factors that directly or indirectly affect the ability to carry on agricultural production and measures that relate to matters referred to in clauses a, b, c and d;

f) increased public awareness of the importance of soil conservation;

g) trustee and disburser of the Agricultural Productivity Compensation Fund described more fully in a later recommendation (Section 3.1.1);

h) laws in force in Alberta that relate to, or that directly or indirectly affect the agricultural land base;

i) the Board should be required to prepare an annual report to the Legislature outlining its experience in achieving the goals and objectives outlined under clauses a to g.

The ARCB would have a major role to play in co-ordinating and collecting information on a province-wide basis about developments likely to affect agricultural land. It would also have responsibility for continually monitoring and reviewing the actions of both provincial agencies and rural municipalities to ensure that good agricultural land is not wasted, and a responsibility to recommend ways to better preserve and conserve the land base.

The Panel visualizes the ARCB as being staffed by many of those responsible for the existing portions of its mandate that now rest with Alberta Agriculture. Another part of its mandate would involve the transfer of responsibility for the Agricultural Service Boards from Alberta Agriculture to the ARCB. The Panel envisions the ARCB as providing advice and support to the Agricultural Service Boards and to rural municipalities in their attempts to maintain, conserve, and enhance the agricultural land base. This would include access to all information compiled by the ARCB, such as information about industrial developments, transportation systems, and farming practices, since this type of information is necessary for good decision making at the local level.

The Agricultural Service Boards have a clear legislative mandate and authority for the conservation and maintenance of the agricultural land base. However, these Boards have not had a great deal of support and their funding has been marginal. They are, however, a good foundation upon which to build.

The Boards already have a legislative and organizational base, so action in dealing with soil conservation problems can proceed directly under existing legislation. What is required for the Boards to become more effective is increased resources and provincial direction. The Panel believes these should be provided by the provincial government. Local Agricultural Service Boards should look to the ARCB for funding and direction as well as advice and support, but this information exchange must go both ways. The Panel believes there would be merit in providing an Advisory Committee to the ARCB composed of representatives of Agricultural Service Boards. This would provide the ARCB with continuous grass roots input in the identification of problems, suggestions for handling province-wide matters relating to the agricultural land base, and modifications to approaches, policies, and operations that respected local situations.

The Panel's view is that the most appropriate institutional mechanism for conserving the province's agricultural resources is a combination of local regulatory control and provincial guidance. The local municipality has the authority and information for making better decisions, while the ARCB, on behalf of the province, would have the ability and authority to integrate information from across the province, to provide feedback on the implications of decisions being made, and to recommend alternative courses of action. The local and provincial systems need each other.

Many of the decisions which affect agricultural land are now made at the local level. The Panel believes this is appropriate, as local knowledge and information are critical to decisions to conserve the agricultural land base. The provincial government has recognized the desirability of making the local municipality primarily responsible for the implementation of regional plans and the protection of the agricultural land base. However, having identified the responsibility, it has not provided the full range of powers necessary to fulfill that responsibility. Consequently, this Panel recommends "that the responsibility for the maintenance of the agricultural land base rest with the rural municipalities of Alberta. The responsibility to protect the agricultural land base should be accompanied by the power and authority necessary to achieve this objective."

Local councils now have the authority to control two of three regulatory means for directing development; that is, land use bylaws and development permits. Subdivision approving authority is an anomaly, since this authority normally lies at the regional planning commission level with an appeal to a provincial board (the Alberta Planning Board). The Panel is of the opinion that if the responsibility for conservation of agricultural land is to be placed at the municipal level then the tools necessary to do the task must also be available at that level. The Panel believes that subdivision approval should be a municipal prerogative, as are the granting of land use changes and development permits, with appeal lying to municipal council as a whole and to the courts.

It has been suggested that local municipalities are not competent to approve subdivisions. The Panel, however, is of the opinion that local decision makers are able to make the best assessment of what is appropriate for their area. Municipalities should be required to ask for the comments of their Agricultural Service Boards on any land use amendment, development permit, or rural subdivision application that might affect the agricultural land base. However, having obtained that advice, it should become the municipalities' full responsibility, without overriding direction from or appeal to any provincial department or agency, to approve rural subdivision, as it is to issue development permits or to change land use classifications. The Panel assumes that the Regional Plans currently being adopted and their supporting General Municipal Plans would still apply as a framework for development in rural municipalities.

Municipalities should, however, be subject to a regular post audit by the ARCB, which would be required to comment on how effectively rural municipalities had succeeded in maintaining the integrity of their agricultural land base.

With respect to urban annexations, the Panel recommends that a rural municipality that is subject to an urban annexation application have the right to apply to the Local Authorities Board for an Agricultural Impact Assessment (AIA), to be prepared for the lands under annexation application. The cost of the Agricultural Impact Assessment would be paid for by the applicant for annexation, but the rural municipality would award the contract for the preparation of the AIA to standards to be established by the Agricultural Resources Conservation Board.

CHAPTER 3

MAINTAINING THE AGRICULTURAL LAND BASE

Maintenance of the agricultural land base as an end in itself does not recognize the legitimate land needs of competing uses. Obviously, in a growing province there is need for housing, industrial development, and energy exploration, as well as recreation, forestry, and wildlife habitat. Some of these uses are compatible with some agricultural uses while others are completely incompatible. The priority of uses must be established in clear and concise terms taking into account all of society's needs.

The "highest and best use" is a term which describes the use of land which will command the highest value per acre at any point in time. Many of the uses cited above create higher land values than agriculture. In fact, only forestry, wildlife production, and sometimes recreation uses generate lower values per acre. Markets allocate land uses solely on the basis of land values. However, this neglects the fact that agricultural land values are based only on the potential returns to the farmer or landowner. They do not incorporate the value to the remainder of the economy of the production from that land, both in goods and services purchased and in products that generate additional jobs and value added. Because only the primary productive value is reflected in agricultural land values, the land market signals transmitted are misleading. They suggest that the highest and best use may be for some consumptive purpose, such as country residential development, when the continuing productive use as agricultural land would be most beneficial to the provincial economy as a whole. A recommendation to modify these misleading signals and provide rising levels of protection to better quality agricultural soils is discussed later in this chapter.

Agriculture in much of the western world is highly subsidized. This is possible because these same areas are highly industrialized. Canada, with a scattered small population, a less substantial industrial base, and a relatively large agricultural industry, has not felt able to afford the levels of subsidy common in the European common market, or even in the US. Consequently, subsidies to Canadian agriculture are among the lowest in the western world. (This phenomenon is more fully described in Section 2.1.4.1 of this report).

Yet because much of Canada's agricultural production, particularly from western Canada, is exported, returns for this production are basically world export prices less the freight charge, because of the inland location of Canada's grain-growing area. Consequently, Alberta's agricultural industry must remain more efficient and produce higher quality products at less cost than its world competitors in order to remain viable.

To accomplish this, agriculture requires an efficiently organized land base to utilize efficient technology, and the retention of lands where returns are high and input costs are lowest; that is, the retention of our best quality soils. The sale of agricultural commodities earns important export dollars for both Alberta and Canada, giving Albertans an interest in maintaining the land base in a form which allows present and future production to be competitive.

It follows that policies to maintain and expand Alberta's agricultural land base must consider the viability of agriculture, rather than conserving agricultural land as an end in itself. These policies must consider the potential need for farms to grow, the effects of policies on agricultural land prices and the maintenance of higher quality, lower cost agricultural soils. The policies must result in a flexible land-use system because future technology cannot be predicted. The development of technology in agriculture and transportation, both on the farm and through the marketing chain, must not be impeded.

Cultivation of land began in Alberta with the first influx of settlers. Since then, the technology has changed from relatively small fields cultivated with horse-drawn equipment to large fields cultivated with large machines, using mainly varieties bred and adapted to Alberta's climate. The use of summerfallow to increase production, store moisture, and control weeds has been replaced in much of the province by fertilizer use, chemical weed control, and timely cultivation. There is general agreement among agrologists that the practice of summerfallowing degrades soil by decreasing organic matter and increasing the risk of salinization and erosion. Future technology may include "no till" crop production and nitrogen-fixing cereal grains. Indeed, future technology is limited only by our imagination and our research resources. The future may hold techniques of production which include aerial seeding and chemical application or remote-controlled ground equipment, of capacities and sizes not now imagined. There must be allowance for all of these contingencies in any policy developed to ensure the maintenance of the agricultural land base.

However, there is no indication or expectation that any new developments will make land of poorer quality equivalent in productivity to better land. New agricultural techniques have had their best returns on better quality soils in the past and that is not expected to change.

3.1 Private Land Use in Alberta

Many land uses compete with agriculture in the settled rural areas of Alberta. Some of these uses can co-exist with agricultural activities, while others result in land being removed from crop production on a permanent basis.

3.1.1 Urban Growth and Rural Subdivision

The conversion of rural land to urban uses is permanent, and causes a substantial loss of agricultural production. On the other hand, many farm families rely on off-farm income to support their farming operations, and access to an urban center is an advantage in terms of providing job opportunities. As well, urban centers provide goods and services to rural residents, and may also provide a market for local produce. Cities have always needed the country and the country the city.

The post-World War II period has seen many changes in attitudes, affluence, mobility, and population growth, which have led to increasing urbanization in North America. Alberta is no exception; according to the 1981 census, 22.8 percent of Alberta's population was rural, down from 25 percent in 1976; however, the actual farm population made up only 8.5 percent, while 14.3 percent were rural non-farm people. Most of the urban growth in Alberta has occurred in the areas around Edmonton and Calgary, and in the Edmonton-Calgary corridor; the proportion of Alberta's population living in this corridor increased from less than 10 percent in 1901 to about two-thirds in 1976 (Thompson 1981a).

Urban influences also expand into rural areas through country residential development. Although the processes of urban growth and rural subdivision are accomplished and regulated in different ways, they both cause land to be removed from agricultural production. Another common feature is that several agencies are involved in the planning and approval processes.

The intrusion of urban influences into agricultural areas tends to alter land use patterns and may also lead to social conflicts, environmental problems, and higher land values. During the public hearings, loss of agricultural land to urbanization, conflicting urban and rural values, and the whole land use planning process were often addressed concurrently. Urbanization of agricultural land was a concern in both large and small centers (17, 39, 74, 179, 188, 231, 232, 252, 269). The consequences of this expansion are seen to threaten the agricultural industry in several ways:

1) Good land is lost directly through annexation and development for urban purposes or rural subdivision for country residential development (17, 30, 83, 249, 252). However, others expressed the opinion that loss of agricultural land due to urbanization in general was considerably less than that due to deteriorating soil quality (57, 129, 208, 241, 256) or other practices wasteful of agricultural production (233).

2) Agricultural land within urban boundaries or land threatened by annexation does not have adequate tenure to ensure proper farm management practices (42, 61, 65, 208, 257).

3) Urban fringe land prices create a ripple effect which distorts land values throughout the agricultural community (42, 133, 216, 240).

4) Rural non-farm residents often are not sympathetic to farmers' requirements or management practices (30, 118, 192, 195, 221, 224).

Urban Growth — Many of the characteristics which make an area suitable for farming also make it well-suited for the establishment of towns and cities. It was pointed out that many of Alberta's early settlements were established on good agricultural land, and as they grew the incorporation of more and more of those lands into the towns and cities was inevitable (208). Furthermore, it was suggested that these urban areas have a symbiotic relationship with agriculture, and that each depends on the other for economic support as well as support and interaction in cultural, recreational, and social activities (61, 125, 201, 209, 210, 223, 237).

The rate and scale of urban expansion varies across the province. During the period of rapid growth in the late '70s, the amount of land utilized by urban municipalities was greatest in the vicinity of the Edmonton-Calgary corridor (Thompson 1981a), and some hearing participants expressed concern over the rate of growth in this area (30, 39, 74, 233).

In many cases a prerequisite to the expansion of urban areas is the process of annexation. The Local Authorities Board (LAB) has responsibility for annexation approval in Alberta, and presently encourages municipalities to plan annexations for the relatively long term of 20 to 40 years. This is done on the theory that it is preferable to deal with one major application rather than have the municipality repeat the procedure every few years. This policy was questioned by hearing participants who argued that 20 to 40 years is too long and that it is impossible to accurately predict land needs that far in advance (12, 42, 65, 76, 150, 195, 224). Furthermore, premature annexation can make it difficult to keep agricultural land in production until it is actually required for urban uses, although several people indicated that this continued production is desirable and should be encouraged (65, 208, 223, 231, 237). Other participants expressed the opinion that at least a 20-year lead time was required in order to plan adequately (26, 39, 111, 233, 241), although in some areas where many annexations and rural subdivisions have occurred there is probably sufficient land to meet demand well beyond 20 years, given the present declining growth rate (238, 241).

In its decision to approve or reject an annexation application, the LAB considers alternative land uses, including agriculture, as well as need, feasibility of servicing, impact on the adjoining rural municipality, financial and social impact on the municipality, and planning and design. Alberta does not have a provincial policy relating to the consideration of agricultural capability of land under an annexation application, although regional planning commissions mildly discourage annexation of good agricultural lands, and the LAB takes into account opposition to an annexation application because of quality of land for agriculture (such as opposition from Alberta Agriculture, the regional planning commission, or the landowner). If the application is approved by the LAB, the decision is scrutinized by Cabinet, which can approve, reject, or alter the Board Order; if the LAB refuses the application, it is not scrutinized by Cabinet. The relationship between the Local Authorities Board and Cabinet was the basis for some discussion during the hearings, much of it stimulated by the Edmonton annexation decision, with commentors generally expressing dissatisfaction with the direction and scale of the annexation (26, 30, 39, 55, 72, 83, 111, 125, 224, 231, 237, 249, 257). On the other hand, there have been few problems with annexations in a community like Wainwright because of excellent co-operation from the people whose land was being annexed, the small amount of land required, and the town's efforts to keep residents informed of its development needs (107).

The widespread unfavorable comment at the public hearings about the decision to annex large areas of prime agricultural land to the city of Edmonton indicates the depth of public concern over the issue of annexation. In certain instances, the Local Authorities Board presently attempts to give annexed land protection for a period of time by ordering that the land shall be assessed for agricultural purposes for a number of years or until converted to another use. The agricultural lands annexed to the city of Edmonton, or other areas, would be able to be productively used for agriculture for a long period if the following recommendation were adopted: that "all land and buildings used for primary food production that are annexed to an urban municipality be treated for assessment purposes as though they had remained in the rural municipal jurisdiction, accompanied by municipal service levels similar to those of the rural municipality, until these lands are converted to a use other than agriculture." This recommendation would ensure that annexed agricultural lands would continue to receive the same treatment as if not annexed and therefore would be encouraged to remain in agricultural production, at the choice of the owner, as long as possible.

Some hearing participants suggested that more efficient use of urban space would reduce the pressure for annexation and thus the amount of agricultural land taken out of production. Increased urban densities could be achieved by land use reclassification to permit more multiple family units, by infilling vacant land presently found in urban centers and by other means (26, 30, 71, 74, 83, 111, 172, 179, 183, 208, 231, 268). Urban planners, however, must consider factors such as aesthetics, recreational pressures, and overall quality of life when deciding whether to recommend infilling or increased density (50, 74, 179, 182, 194, 208, 233, 237), and it was suggested that taking steps to increase urban density would result in renewed and increased demand for country residential development (84, 208). Some people maintained that urban municipalities already use land more efficiently than rural ones (26, 233, 241), and that what is needed is better co-ordination between urban and rural municipalities in the planning and development process (42, 127, 208).

The question of whether urban growth should be controlled is not a new one. Some hearing participants acknowledged that restricting the growth of our urban areas would be difficult, unrealistic, and generally undesirable (128, 192, 208, 210, 221, 224); others maintained that urban growth must be controlled and that a strong stand should be taken against annexation of land for urban growth (68, 196, 263, 267). However, it was acknowledged that it is very difficult to limit people's choices and tell them where they can or cannot live (74, 84, 233). Many people at the public hearings suggested either that urban growth and development only be allowed on poorer agricultural land (30, 31, 40, 54, 70, 83, 92, 102, 104, 106, 115, 126, 129, 134, 138, 145, 162, 172, 188, 196, 229, 234, 263, 268), or that it be directed to poorer land whenever such land is available (74, 83, 135, 136, 182, 195, 233, 241). Others were concerned that since poorer land costs more to develop and service, absolute avoidance of high-quality agricultural land could be reflected in much higher costs for urban residents (26, 195, 208, 225, 233, 241).

Rural Subdivision — Rural subdivision is the division, in a rural municipality outside the boundaries of an urban area, of a registered parcel of land into more than one parcel, each with separate legal title. A parcel of land can be subdivided for various purposes, but the most common purpose is for country residences. Subdivision for the purpose of country residential development or to provide a farmstead separation for a retiring farmer were the uses which received the most comment during the public hearings.

Country residences, or acreages, have become popular with many former urbanites for a variety of reasons, many of them having to do with the desire for an alternate life style. The country is considered to offer amenities such as more privacy and peaceful surroundings away from noise, crowds, and traffic; open space for gardening and other recreational activities; and a more "wholesome" environment for raising children. However, to others, country residential development represents an intrusion of urban-oriented values and life styles into the agricultural community, with the result that not only is agricultural land removed from production but social, economic, and political conflicts increase. Although many participants at the public hearings expressed concern about these issues, no one was prepared to say that country residences should be abolished and people told that this life style was no longer an option.

One area of concern could be classed as "social" conflicts. These generally related to differences in life style and background, with rural farm residents often feeling that rural non-farm residents are not knowledgeable about farm management practices and complain about things which are part of the farm environment. Livestock operations in particular were mentioned, since the odors and noise associated with these can be especially unpleasant. Many people mentioned these problems (18, 19, 30, 42, 55, 61, 76, 157, 206, 245), as well as the fact that adjacent acreages can restrict the future expansion of intensive livestock operations (195, 197, 206, 245). Other farming practices such as pesticide spraying were also mentioned as the source of some conflict (195), while on the other hand, dogs owned by non-farm residents harass livestock, creating problems for farmers (118). Others felt that there are problems with compatibility as urban attitudes become more apparent in rural areas. Acreages fragment the farming community (179), and it was suggested that there are more problems with clustered country residential developments, since these are less likely to be integrated into the farming community (118, 192).

The planning of acreage developments was addressed by a number of people. Country residences were said to be responsible to a greater degree than any other use for the fragmentation and conversion of agricultural land (57), though others said that loss of agricultural land due to country residential use in their area is not significant (61, 136, 150). It was felt that poor planning and design of country residential developments have created problems for agriculture (272), and despite the concerns mentioned in the preceding paragraph and those of the Edmonton Metropolitan Regional Planning Commission (238), a number of people felt that clustering was better than scattered development (30, 39, 50, 54, 70, 117, 120, 151). Others pointed out that acreages could be infilled (231), and it was suggested that approval for country residential developments be denied unless they could be converted to higher urban densities without expropriation or replotting schemes (233).

Another category of disagreement could be broadly termed "economic" issues. Some of these had to do with the level of services required for country residential development and who should pay for them. It was argued that it is more difficult and time consuming (and thus more costly) to farm near an acreage (118), and that improvements and services such as wider and better roads are demanded by country residents but paid for by taxpayers generally (17, 19, 84, 120, 241). It was also suggested that country residential subdivisions should be self-supporting to avoid tax inequities (18). Others suggested that taxes should be increased on rural land and buildings not used for agricultural production to discourage country residential development (39, 93, 221, 257, 261).

Nevertheless, it was pointed out that non-farm residence assessment taxes help the municipality provide better services, schools, and commercial infrastructure for all residents (84, 201) while one person suggested that more tax revenue is derived from acreages than from farmland (258). A few presenters said that, in their areas, increased population is needed and if country residences help to achieve this, then they are desirable, especially if there is sufficient land to accommodate them (136, 150, 201).

The opinion was also expressed that a balance does exist between farm and non-farm tax support for services (94). Local municipal representatives could not identify whether the increased taxes from country residential development were sufficient to cover their increased costs since records of municipal costs are not kept on the basis of land uses; however, whether country residences are a benefit or cost to the municipality is identified as less important than social factors and the freedom to live where one chooses (84, 136, 150).

The process of subdivision, particularly the concept of "first parcel out", was the basis for many comments at the public hearings. Some participants expressed agreement with the "first parcel out" policy (54, 136), especially when it enables retiring farmers to remain on a small parcel of land (38, 71, 183), yet still frees up the bulk of their investment (111, 128, 133, 238, 264). However, it was suggested that decisions should still be made on a case-by-case basis (182, 240) and the parcel should be as small as possible (128, 240).

Others supported the policy because it could help farmers experiencing short-term debt problems to sell a small piece of land and obtain sufficient revenue to stay in business (238, 264), or the money could be reinvested in land in a better location (84, 264). Critics, on the other hand, opposed "first parcel out" for various reasons (42, 138, 152, 168, 234). It was pointed out that "first parcel out" only benefits farmers near urban areas (152), and that the policy fosters speculative attitudes (138, 234) and contravenes the principle of local autonomy being advocated by the Alberta Planning Board (42). It was also argued that encouraging the sale of capital assets such as land in order to solve financial problems is the wrong approach (152).

The matter of how minimum parcel size relates to the viability of an agricultural operation was also discussed (18, 38, 61, 84), with the discussion generally focusing on whether minimum size should be 80 or 160 acres. It was pointed out that small-scale farming operations such as market gardens and greenhouses can be highly productive on very little land (101).

Two areas of discussion reflected a good deal of consensus among public hearing participants. There was widespread agreement that country residential development should be restricted to poorer quality agricultural land, or directed away from prime land (7, 23, 26, 31, 38, 64, 65, 70, 77, 79, 84, 94, 111, 115, 125, 128, 136, 183, 192, 193, 194, 224, 225, 241, 245, 250, 255). It was pointed out, however, that some land with a high CLI classification is in fact unusable for farming due to lack of access, poor management, or local soil anomalies, and that this land should also be considered for subdivision or other development (84, 90, 201). Fragmented parcels are usually given automatic title from the Land Titles Office, and it was suggested that these parcels should go through the subdivision approval process just as other applications do (111, 195). Another presenter, however, pointed out that even in the case of fragmented parcels there can be problems (264). Other presenters warned that concentration of development on poorer land would not necessarily ensure the protection of agricultural land, since such land would then not be available for urban growth or industrial development (25, 26, 233). The other matter on which there was agreement was that smaller parcels (for example, between one and four acres) should be the norm for future rural subdivisions (17, 30, 39, 50, 55, 71, 76, 81, 111, 183, 240).

Several individuals indicated that the whole matter of rural subdivision and country residential development may have resolved itself, since in many parts of the province where rapid development occurred in recent years, there is now a surplus of these properties on the market (19, 84, 238). If sufficient recreational opportunities are provided locally and adequate land retained for this purpose, the demand for new acreages could remain depressed (185) even when the economy recovers.

Clearly country residential development is a major competitor for rural land. Although hearing participants could identify problems for the agricultural community from country residential development, no one was willing to deny people the chance to have a home in a rural setting. Provision must therefore be made for country residential uses, but in such a way as to minimize their impact on the agricultural land base.

The Panel believes that future additional country residential lots can be accommodated with a minimal impact on the agricultural land base. To achieve this, the Panel recommends that the guidelines suggested below be followed.

a) The regulations under the Planning Act prohibiting subdivision for country residential use within five miles of a town over 5,000 population and correspondingly lesser distances for smaller municipalities should be dropped. This provision tries to ensure easy and orderly transition to development for urban purposes by maintaining land that is most likely to be required for urban expansion in parcels that are as large as possible. In the past, in the absence of adequate planning of subdivisions, this was no doubt essential. However, through relatively inexpensive preplanning it is possible for lots of typical country residential size to be resubdivided for urban residential development without complex replotting. (This would not be true for industrial and commercial uses). The development of Joint General Municipal Plans between urban municipalities and the rural areas (as pioneered in the Smoky River Joint General Municipal Plan) is a method of identifying the future direction of commercial and industrial growth and should be encouraged and supported by regional planning commissions and the Department of Municipal Affairs. The Panel has observed that former Veterans' Land Act (VLA) small farm lots have been successfully incorporated into many Alberta municipalities and today form pleasant urban residential areas.

b) In those instances where urban municipalities have annexed extensive areas of farmland, country residential and large lot residential uses should be encouraged within urban boundaries as an interim use. Again, through judicious preplanning, it would be possible to provide for future resubdivision to higher residential densities.

c) The further subdivision of already existing country residential parcels should be encouraged. Owners of ten-acre parcels who wish to create two five-acre parcels, or ten one-acre parcels, should be encouraged to do so.

d) Preferential locations for additional country residential development should be:

    i) Existing parcels less than 20 acres.

    ii) Parcels adjacent to already existing intrusions into agricultural areas such as schools, community halls and facilities, and commercial developments such as stores and service stations. A number of rural hamlets could provide excellent large lots or country residential sites within their boundaries.

    iii) Parcels that are physically isolated from active agriculture by physical features such as coulees, water bodies, and so on.

    iv) The bottom 10 percent of the municipal assessor's farmland assessment roll in locations where development would not interfere with agricultural production.

The Panel believes that the above suggestions illustrate the possibility of providing ample country residential development for those who wish such a life style along with a minimal utilization of, and intrusions into, the agricultural land base.

Responsibility for Land Use Decisions — Various opinions were expressed during the public hearings about which level of government should have responsibility for protecting agricultural land. The lack of a consistent provincial land use policy was mentioned often, with the perceived result being overlapping responsibilities, occasional conflicting decisions and goals, and generally a piecemeal approach to land use planning in Alberta. Many suggested that direction from the provincial government was required, but there were differences as to how such a policy should be interpreted and implemented. There was some concern that local authorities who were trying to do a good job had been overruled in the past by provincial authorities, and that this creates a difficult situation for local people (42, 70, 96, 150, 224, 237). Presenters opposed increased local control over land use decisions because of the lack of direct responsibility and for other reasons including concern that local councils are subject to local political pressure, that decisions are made on whims, and that more continuity of personnel and planning is needed to make long-term decisions (11, 18, 19, 24, 72, 118, 191, 193, 225, 237, 274). Others wanted to see local control increased, since local authorities were considered to be more knowledgeable and sympathetic to local circumstances, and this would provide the flexibility to assess each situation independently (127, 133, 192, 194, 224). Five regional planning commissions believed that with support and some minor modifications, the existing system would be adequate to control land use (12, 42, 111, 150, 182). This position was supported by three other briefs (70, 156, 241). After careful consideration of all these representations, the Panel believes that responsibility for maintaining the agricultural land base should rest with the rural municipalities of Alberta, and has made a recommendation to that effect (see Section 2.7.3).

In considering municipal responsibility for land use and the agricultural land base, the Panel identified an anomaly in what it considers to be primarily a land use decision, and therefore recommends "that the location of feedlots and intensive agricultural operations be a matter of municipal control under land use bylaws."

The certificate of compliance system is now voluntary and provides no statutory protection to the operators. Regulations under the Public Health Act relating to the location of intensive agricultural operations, particularly the arbitrary 1,500-foot limit, are not appropriate criteria for the location of an intensive livestock operation. The control of feedlot location should be at a municipal level where all factors that bear on location of intensive operations could be fully considered.

During the public hearings, the Panel heard statements that certain types of uses, such as industrial or country residential, were beneficial to the municipality because of increased assessments and municipal revenues. They also heard arguments to the contrary, that servicing non-agricultural uses, particularly if the development proceeded only partially, if it were in a difficult-to-service area, or the service requirements were high, could be very costly to the municipality. Though the Panel made many inquiries, it received no satisfactory answers on the costs of servicing from municipalities or provincial departments.

The Panel believes that this information is essential for municipalities to make good land use decisions, and therefore recommends that "municipalities should be urged to collect information on the cost of providing services to various types of uses in different areas of the municipality relating to different levels of existing and proposed infrastructure."

Municipalities are presently required to collect information on municipal revenues and expenditures in a standardized format that is comparable throughout the province and across the country. Unfortunately, this information collection system was not devised to provide information that is essential to make appropriate local government management decisions. Although municipalities can precisely identify revenues generated by different types of land use, they cannot identify the costs incurred in providing services to these same areas.

Without a system of cost accounting for municipal management purposes, municipalities are essentially making decisions without a full appreciation of the cost consequences of these decisions. The Panel believes that, although revenues increase substantially when land is removed from agriculture and turned to non-agricultural use, costs associated with the new use may increase more than revenues. Unfortunately, evidence to support or refute such a statement is not available, and it should be, to permit effective municipal management.

The interdependence of our urban and rural areas is critical; a balance between the province's need to grow and diversify and the need to maintain a viable agricultural industry is required. The Panel realizes that urban development is essential and that frequently no other alternative is available than to use good farmland. However, the decision to utilize good farmland should only be made after all alternatives have been fully examined and the costs and benefits, not just to the urban center but to the urban and rural communities and the economy as a whole, have been fully considered. In this regard, the Panel sees the major function of Alberta's regional planning commissions as providing for the orderly transition from rural to urban development, and therefore makes the following recommendation. "In the identification of the appropriate growth options for major roads, utilities, and the expansion through annexation of residential, commercial, and industrial developments, the regional planning commissions should develop benefit/cost analyses of the alternatives that consider not only the cost to the urban centers, but the costs to the economy as a whole of the various alternatives for development."

At present the urban planning system provides for expansion along the lines of least resistance (frequently prime farmland in large parcels). The only costs given any explicit consideration are extra costs that may be involved in the provision of services or in developing fragmented parcels. Explicit consideration should also be accorded the impacts on the farming community and the economy of the utilization of farmland for urban development.

Replacement of the Productivity of Lost Land — There are many instances where agricultural land, even good agricultural land, has to be used for non-agricultural purposes. In the Panel's view that could be justified if:

a) the alternatives and options to the use of agricultural land had been fully canvassed (as provided for in the above recommendation);

b) if the full loss to the economy, not just the loss to the individual landowner, were fully compensated.

Demand for agricultural land takes two forms: demand for land as a productive good, and demand for land as a consumptive good. As a productive good, land is valued by the physical production that it can generate in conjunction with capital, labor, and management skills. Land with high capability, that is, able to produce large volumes of a wide variety of crops on a consistent basis without extraordinary levels of inputs, will have a higher value than lower capability land. Throughout the province, rural land varies in its agricultural productivity value based on its quality and other factors such as access to markets.

The agricultural productivity value of land is typically much less than its value as a consumptive good. As a consumptive good the fact that land can grow food is irrelevant. What is critical is location and the availability of various types of infrastructure such as roads, sewers, and water, and access to commercial and institutional facilities, shopping, schools, recreation, and office and industrial employment. Land used for urban purposes is characterized as a consumptive good since once the flurry of activity associated with its consumption (such as the installation of services or the construction of the housing unit) is over, the land no longer produces a stream of goods, income, and employment. This is not true of industrial or commercial land uses which do provide sites for the continued generation of production, income, and employment. However, the productive physical capability of the land is irrelevant to commercial and industrial users, who can equally well use poor agricultural land for their purposes, as long as it has the attributes of location and services that they require.

For consumptive purposes the land itself, or raw land, is a small proportion of the total value. It is the relationship to other facilities and services, the ease with which these can be provided or the possibility that they will be provided, that establishes the value ascribed to land. Where land has these characteristics, its value as a consumptive good will normally outstrip the value for productive purposes very readily. Only the very best of productive farmland can compete against the least of the consumptive uses. Part of the discrepancy is due to the establishment of the productive value of farmland by the value of income, production, and employment that it generates directly for the farmer or owner. The food and other goods produced by agriculture are the basis of an additional net benefit to other sectors of the economy either through goods and services provided to agriculture (such as fertilizer, machinery, and seed cleaning) or the further servicing or processing of goods provided by agriculture (such as storage and transportation, food processing, and meat packing). The ratio of direct (farmer) benefits to indirect (other parts of the economy) benefits from the production of additional commodities, varies from 35:65 where the commodities are exported in raw form, to 9:91 where all of the additional commodities are processed in the region and exported in finished form (Manning and Anderson 1984).

In the irrigation areas the provincial government has provided assistance to irrigation rehabilitation at a ratio of 14:86 (farmer: provincial government) on the basis that the irrigation farmer as the direct beneficiary of the investment in enhanced production capability should only have to assume 14 percent of the costs. The larger economy, as represented by the provincial government, is an indirect beneficiary and therefore should contribute to the extent of 86 percent of the investment. Whether the level of support should be higher or lower is a fine point of economic argument. The ratio of 14:86 probably represents a reasonable level of rough justice and can be defended on that basis. However, although the production per acre in the irrigated areas is much higher than in other parts of the province, the mix of uses and whether commodities are exported in raw form or are fully processed is not much different from the province as a whole. In the province as a whole, about 50 percent of the long-term farm income is from livestock and livestock products, and a similar pattern prevails in the irrigated areas. Although the irrigated areas are over-represented in potatoes, sugar beets, and specialty crops, they are under-represented in oilseeds. The most common crop in irrigated areas is soft white spring wheat, which is grown on 450,000 acres or 49 percent of the irrigated area. Wheat is exported predominantly in unprocessed form. The major difference between irrigated areas and provincial farmland as a whole is the level of production per acre, not the form in which products are exported. For all segments of the agricultural industry, and the economy as a whole, it would be desirable to have more of this production processed in Alberta, and that is an objective of both farmers and the provincial government.

Whatever the precise level of indirect economic benefit, it varies directly with the capability and productivity of the land. Land with a higher net productivity will contribute more to the provincial economy than will land with lower capability (assuming equal levels of inputs in both instances). When low-capability land is withdrawn from the agricultural land base, the impact on the economy as a whole is much less than when higher capability land is removed.

In terms of compensation the farmer is fully rewarded for the direct losses that he suffers when his land is purchased for non-agricultural purposes. The direct potential production, income, and employment that he might anticipate from the continual employment of the land for agricultural purposes is provided for in the purchase price; otherwise he would not sell, except under duress.

However, although the farmer's direct loss is compensated, the loss of the indirect benefits to the larger economy is not provided for. All those who would benefit from additional commodity production, either by providing the goods and services needed to achieve production or by further processing of the commodity, experience a reduction in their well-being. To leave them as well off as they were before the removal of the land from the agricultural land base would require the equivalent amount of net production from an alternate source. For the non-farming sector of society as a whole, the replacement of that lost production would be valued at the level of the net benefits generated by the lost production. If the ratio of direct to indirect benefits is 14:86, then a ratio of six times the loss of agricultural productive value is warranted to compensate for the lost production.

To identify the impact of the loss of agricultural land would require an accurate, comparative, province-wide, parcel-by-parcel and field-by-field estimate of the productive value of agricultural land, excluding any values due to potential use for non-agricultural purposes. Alberta's system of farmland assessment is developed on exactly that basis. In establishing the value of farmland for assessment purposes, the municipal assessor considers only those attributes of land that generate higher or lower incomes from the production of agricultural goods and services, such as soil group, subsoil, texture, topography, stones, and other factors that contribute to agricultural capability (for example, access to markets for commodities). The assessor then establishes the net annual income that the parcel or field can generate in agricultural production, using evidence such as agricultural rental value, and capitalizes the net income production potential to arrive at an agricultural land value.

Farmland assessment seems an appropriate instrument to use in identifying those lands that should be provided varying degrees of incentive to remain part of the agricultural land base, as the following points illustrate:

1) Since the assessor is attempting, with a great degree of care and under the most intense scrutiny, to establish which parcels and fields are capable of providing the greatest agricultural production at least cost, he is also identifying the parcels whose retention in agriculture is most desirable.

2) The assessor also makes allowance for such elements as access to markets for agricultural products, which is an important attribute of the land's agricultural capability in addition to its physical characteristics, but tends to be overlain and confused with urban development potential.

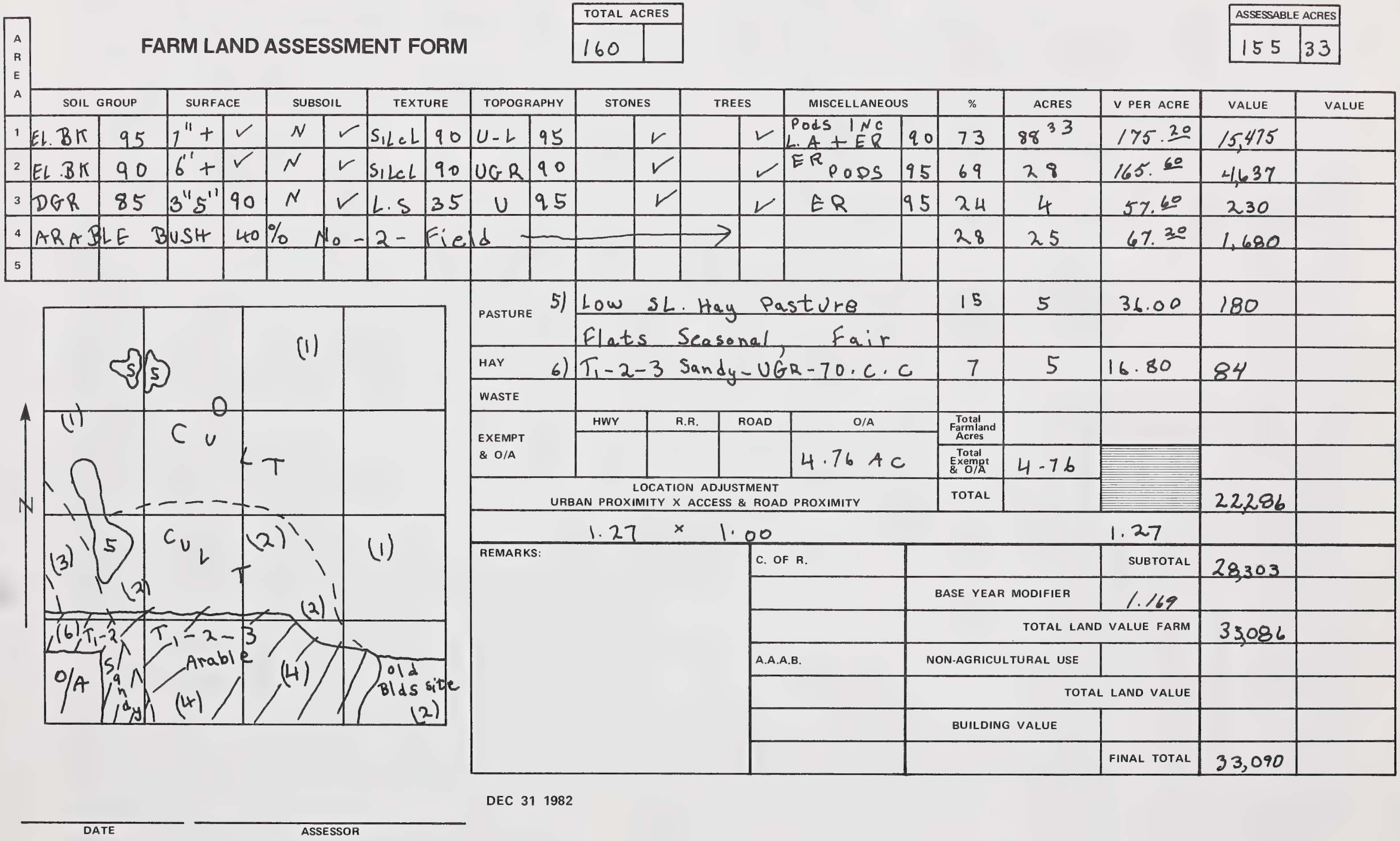
3) The assessor has to wrestle with the definition of what a farm is and who is a farmer. At present the designation as farmland for assessment purposes is beneficial to a landowner and disadvantageous to the municipality, and the definition of farm and farmer is constantly being tested, redefined, and revised. The Panel can visualize no better way to define agricultural and non-agricultural use than is presently being developed day-by-day in assessment practice.

4) The assessment information base is extremely detailed (see Figure 2), available for every parcel in the province, and attempts to value agricultural land with great discrimination from 100 for the best land in the province to 0 for land with no agricultural potential. In this way it is possible to identify those parcels and fields where the incentive to retain the land in agriculture should be greatest and those where the loss of agricultural production would be the least.

5) Finally, the individual parcel owner has the opportunity, once each year, to argue that his land has been inappropriately rated as against his neighbor's or other comparable land in the province.

Having considered these arguments and concerns, the Panel recommends that "the agricultural production lost when land is removed from agriculture should be replaced either by support of agricultural research and development or by practices and programs which would permanently replace the lost production." Based on the earlier discussion of distribution of costs and benefits, the Panel believes that an amount six times the agricultural productive value should be paid into an Agricultural Productivity Compensation Fund, established through this recommendation, when production is lost. The following example illustrates how this value should be determined.

Figure 2 shows the type of information provided on the assessment roll for each agricultural quarter section in the province. In the southwest corner of the quarter is a 4.76-acre parcel not assessed for agriculture. No contribution would be required if this



FARM LAND ASSESSMENT FORM

TOTAL ACRES: 160

ASSESSABLE ACRES: 155 | 33

AREA	SOIL GROUP		SURFACE		SUBSOIL		TEXTURE		TOPOGRAPHY		STONES		TREES		MISCELLANEOUS		%	ACRES	V PER ACRE	VALUE	VALUE
1	EL.BK	95	7"+	✓	N	✓	SiLcL	90	U-L	95		✓		✓	Pods INC L.A + ER	90	73	88^{33}	175.^{20}	15,475	
2	EL.BK	90	6"+	✓	N	✓	SiLcL	90	UGR	90		✓		✓	ER PODS	95	69	29	165.^{60}	4,637	
3	DGR	85	3"5"	90	N	✓	L.S	35	U	95		✓		✓	ER	95	24	4	57.^{60}	230	
4	ARABLE BUSH 40% No -2- Field ⟶																28	25	67.^{30}	1,680	
5																					

PASTURE	5) Low SL. Hay Pasture				15	5	36.00	180	
	Flats Seasonal, Fair								
HAY	6) T1-2-3 Sandy-UGR-70.C.C				7	5	16.80	84	
WASTE									
EXEMPT & O/A	HWY	R.R.	ROAD	O/A	Total Farmland Acres				
				4.76 AC	Total Exempt & O/A	4-76	▨		
LOCATION ADJUSTMENT URBAN PROXIMITY X ACCESS & ROAD PROXIMITY					TOTAL		▨	22,286	
1.27 × 1.00							1.27		

REMARKS:	C. OF R.		SUBTOTAL	28,303	
		BASE YEAR MODIFIER	1.169		
		TOTAL LAND VALUE FARM		33,086	
	A.A.A.B.	NON-AGRICULTURAL USE			
		TOTAL LAND VALUE			
		BUILDING VALUE			
		FINAL TOTAL		33,090	

DEC 31 1982

DATE

ASSESSOR

Figure 2 Farmland assessment form

parcel were used for non-agricultural purposes since it is not part of the agricultural land base. The adjacent 5-acre field has an agricultural index value of 7, and if it were to be removed from agricultural assessment no contribution to the fund would be required. If the large 88.33-acre field in the northeast of the quarter, or part of it, were to be removed from the agricultural assessment roll, it would attract a $2,401 per-acre contribution to the Agricultural Productivity Compensation Fund. If field number 3, of 4 acres and with an index rating of 24 percent, were to move from agricultural to non-agricultural use, it would attract a per-acre contribution of $789.36 to the fund. The values shown on the sample assessment sheet are assessed values. They are calculated at 65 percent of the actual agricultural productivity value, which in turn is adjusted by 1.27 to allow for the effect of location and by 1.169 to provide for increases in value since the base year.

With respect to the Agricultural Productivity Compensation Fund, the Panel believes:

a) that the contribution to the fund should be paid by the owner of record after the land loses its agricultural assessment;

b) all transfers of land from agricultural to non-agricultural uses should be subject to contribution to the Agricultural Productivity Compensation Fund, with the exception of transfers of land in the bottom 10 percent of agricultural productivity as rated by the provincial assessment. This would include those transfers initiated by all provincial government departments and agencies;

c) for transportation developments only those routes that are off road allowances should be required to contribute;

d) though it is not possible to compel federal ministries and agencies to provide an equivalent contribution, every effort should be made to persuade them to contribute on an equitable basis;

e) temporary withdrawals, such as pipelines, drilling leases, or coal mines should not be required to contribute to the fund since they will be returned to the agricultural land base at equal or better capability;

f) municipalities should be responsible for the assessment and collection of moneys for the Agricultural Productivity Compensation Fund, on behalf of the Agricultural Resources Conservation Board.

The Panel further believes that an amount of six times the agricultural productive value paid into an Agricultural Productivity Compensation Fund established through this recommendation would provide:

a) a replacement for the agricultural productivity lost in farmland conversion through the use of the fund to support agricultural research and development;

b) an incentive to avoid good farmland and seek out poorer quality land (such as the bottom 10 percent of the assessment roll) or land already withdrawn from the agricultural land base, for non-agricultural uses. There is a caveat here that this

> poor-quality land should not be in a location where it would interfere with normal farming operations or break up the continuity of farmland. The Panel assumes that existing regional and municipal land use plans and planning activities address that problem adequately.

The objective of the fund would be to replace the agricultural production lost when land is removed from agriculture, by supporting agricultural research and development or practices and programs which would permanently replace the lost agricultural production, such as soil reclamation and conservation programs. The Panel has been impressed with the success of the Farming for the Future program in getting research from the laboratory to a demonstration plot in a farmer's field, and the Agricultural Productivity Compensation Fund should support additional programs along these lines.

If the developer wishes, instead of providing compensation to the fund, an alternative of replacing the lost production elsewhere should be available. The Panel does not believe that our limited expansion capability should be used for that purpose. However, if an ingenious developer could identify some form of intensification that could increase, on existing farmland, the agricultural productivity value to a level where it replaces the production lost, on a permanent and viable commercial basis, then that option should be available.

The Compensation Fund concept allows for alternative means of fulfilling the requirements, both of which help maintain agricultural productivity while recognizing the legitimate nature of certain competing land uses. There are several other unique and beneficial characteristics of this type of farmland protection.

The Agricultural Productivity Compensation Fund concept has the advantages of being immediate, automatic (and therefore consistent in application across the province), known beforehand to those wishing to develop agricultural land, economic in nature, and based on the municipal assessment system already in successful operation. Given these conditions, the buyers and sellers can be left to determine the fair market price for agricultural land. These are very significant advantages over most other systems of land protection which often seem to involve lengthy negotiations, expensive studies, bureaucratic meddling, unsure outcomes, and unavoidable political pressures at several levels of government. Minimizing these usual land use change impediments will save money and time for all parties. Combined with the Panel's recommendations regarding local decision making about land use, the future of our agricultural land base should be ensured with minimal intrusion into the agricultural land market.

The Panel does not wish to leave the impression that the 6 to 1 ratio for determining the amount of compensation that is to be paid into this fund should be carved in stone. This ratio should be determined according to the derived societal benefits from agricultural activity and not necessarily from the current irrigation funding formula. Whatever the ratio is determined to be, it must be applied consistently and automatically across the province. Local differentiation is accommodated through the detailed assessment procedures which are now in operation.

Agricultural land may be a resource which is mostly privately owned, but the benefits of the continued availability of this resource extend far beyond the present owners. Desire to preserve the best agricultural land is motivated by a concern about the future, and that concern is not exclusively for farming or farmers, but for the economy and society as a whole. Self-sufficiency in food at an affordable cost is a basic goal of many nations. Even exported food products help support self-sufficiency by providing foreign currency for purchase of imported food. In sum, the Panel views the concept of an Agricultural Productivity Compensation Fund as a mechanism whereby the interests of society as a whole are intended to be protected over the long term.

The Panel does not see the outright prohibition of non-agricultural development, as practised in Quebec and British Columbia, as being appropriate for Alberta. Alberta's objective should be to conserve land, to replace the production and the capability that would otherwise be lost, so that agriculture and processing of agricultural products can remain as an important economic sector. If non-agricultural development requires certain farmland strongly enough it should be able to use it, but only after it fully compensates for the loss, both directly to the farmer/owner and indirectly, through the Agricultural Productivity Compensation Fund, to the economy as a whole.

3.1.2 Linear Developments

Transportation systems for people, energy, and material goods link distant points and cross various land uses along the way. Different decision-making patterns, land requirements, and other impacts, both in the construction and maintenance phases, characterize each transportation system. The loss of agricultural lands to these types of uses was commented upon during the public hearings (29, 36, 76, 108, 174, 250) as was the value of directing these uses to poorer agricultural lands (40, 65, 81, 115, 183), although one presenter stated that reclamation is often easier on good soil than on poor soils (247). It was also stated that in some areas losses to these uses are small (7, 57, 211).

Roads and Highways — Avoiding high-quality land when widening roads is impossible if the original road traversed such land. The Red Deer Regional Planning Commission representative said that within the jurisdiction of the commission, between 1976 and 1981, 3,000 acres were lost to road construction, 60 percent of which was CLI Class 1 to 3 land (182). Other hearing participants also commented on the amount or the quality of land used for roads (65, 172, 191). The amounts of land used for rights-of-way were considered to be excessive (29, 94, 124, 172, 179, 208, 233); specific concerns included road rights-of-way several times wider than the road surface itself (179), and the amount of land dedicated to noise attenuation (233). Reduction in size of rights-of-way was recommended for both rural (29, 124, 172, 179, 191) and urban areas (74, 233).

Utilization of rights-of-way was a point of discussion at the hearings. The verges of roadways can be used for wildlife habitat (2, 267), as a pollen supply for the honey industry (98), or for various other forms of agricultural production (29, 50, 54, 82, 124, 179, 192). Alberta Transportation encourages farmers to obtain a permit and cut grass in the ditches, but many of the briefs calling for agricultural use of the rights-of-way advocated changes in construction practices, such as backsloping and adding topsoil (29, 50, 94, 124, 179), so that the rights-of-way would be more productive whether used for cereal or forage production. It was also suggested that topsoil be removed and used elsewhere when new roads are constructed (90). Roadside ditches also act as drainage systems which may or may not be compatible with regional topography or agricultural interests (86, 94, 152, 229, 253). Problems with inappropriate placement of ditches can become severe, particularly in northern Alberta where erosion can be substantial (152, 253).

The development of rural subdivisions leads to higher traffic volume (19) which in turn leads to a need for roads which meet higher safety standards, and consequently a greater land area is required (195).

Another impact of roads is that they can fragment the land base (76). This can mean that parcels become uneconomic to farm due to equipment limitations or difficulties in gaining access to the parcel (94, 138). Safety considerations, however, may be more important than agricultural impact in the design of roads (50), though it was suggested that reductions in speed limits would avoid the need for large rights-of-way (94). Alberta Transportation and Alberta Environment should be encouraged to plan road systems years in advance, so that farmers can work their land efficiently without the obstruction of restrictive caveats (70). One group suggested that Alberta Transportation should involve the Agricultural Service Boards when developing road programs (94).

Old rights-of-way abandoned in favor of new ones built to higher standards can fragment agricultural land. It was suggested that when new roads are being constructed the old road beds could be levelled and seeded (106), that old roads could be reclaimed under authority of the Land Surface Conservation and Reclamation Council, and that Alberta Transportation should be subject to the same requirements for reclamation as private industry (94). Abandoned roads and schoolyards could be returned to the titles of adjacent properties (53).

It was pointed out at the hearings that industrial road development can benefit the agricultural industry; oil and gas industry roads, as an example, have facilitated agricultural expansion in some parts of the province (15).

Pipelines — Pipelines are used to transport petroleum products in both raw and refined forms. There are about 112,000 miles of pipeline in Alberta; they use about 800,000 easement acres of land (15). Depending upon location and the installation procedures used, pipelines can have positive, negative, or marginal impacts. Some hearing attendees commented on positive aspects of pipelines; that is, that in some situations, using appropriate techniques, pipeline construction can actually improve soil conditions (94, 99). It was suggested that in some cases in the Municipal District of Foothills the grading on reclaimed land is probably better than it was in the natural state (29), while another person suggested that in northern areas there is potential for pipelines to increase beef cattle range (247). However, due to the length and number of pipelines, there is considerable opportunity for large negative impacts if pipelines are poorly installed (99). A wide range of soil and topographic conditions is encountered during pipeline construction (99, 247), so careful on-the-ground control is required (99). Research to determine the optimum stripping depth for Grey Wooded soils, and to develop equipment which can strip topsoil from the ditchline only and give more precise depth control (247) would help provide such on-the-ground control. If pipelines are not constructed properly, as is sometimes the case with frozen or wet soils (94, 99), productivity can be impaired. Examples of this can be seen in northeastern Alberta (99). It was argued that even with properly installed pipelines, there is a loss in soil fertility, for example, a 50 percent or greater loss of organic matter (169). In addition, spills resulting from pipeline ruptures followed by inadequate cleanup can cause damage (108). It was also stated that reclamation certificates may be issued under conditions unsatisfactory to the landholder (67).

Powerlines — Powerlines are found throughout the province with about 92 percent of their length occurring in agricultural areas; however, only about 16 percent of the total length of powerlines owned by utilities is located off the road allowance (211). About 400 ha (985 acres) of land are taken out of production by transmission lines, distribution lines, and substations (211).

Powerline towers can obstruct irrigation operations (64, 211) or require extra passes with machinery in dryland farming (211), while the lines pose a hazard to aerial applicators of chemicals (211). Soil compaction during construction can also occur (211). Agricultural impacts can be reduced or eliminated with underground lines (64, 211) or different tower designs (211) at increased cost. Although property owners are compensated for the problems caused by powerlines (55, 211), it was suggested that compensation should be made retroactive (55). The presenter of brief 81 indicated that local government input into decision making for powerlines was also desirable.

Some concern exists about the effects of induction fields near transmission lines, with some evidence available to show reduced honey production from hives (211), but little evidence of effects is available for other agricultural endeavors (211). It was pointed out that equipment is grounded where required (211).

Railways — Railways are an important means of moving agricultural products and requests for more or improved rail lines were heard, particularly for northern Alberta (136, 225). The concern from a land base perspective seemed to center mainly upon the need to reclaim abandoned lines and put them into some type of production (53), or take advantage of their value as recreation areas (205) or wildlife habitat (53).

Corridors — Frequently suggestions were made to combine several uses into a common corridor (42, 54, 55, 64, 76, 94, 111, 120, 124, 154, 226, 240, 250). The Panel was told that utility companies endeavor to put powerlines on roads whenever possible (211). Another presenter stated that giving the approval mechanism for rights-of-way to local or regional authorities might improve co-ordination of linear developments (54).

3.1.3 Industrial Uses

Power Generation — Electrical power is generated in Alberta by thermal plants or by turbines in hydroelectric facilities. Agricultural lands can be affected by these two types of power generation facilities in many ways and for varying periods of time. Thermal plants usually consist of the plant site itself, associated cooling ponds, and the mining area. The site and ponds can be expected to be in use for at least 20 years but the mining area can be returned to agricultural or other uses in a much shorter time (211). About 80 percent of the power generated in Alberta comes from thermal plants using coal as an energy source[1] and most of those plants are located in the agricultural region of the province (207, 211).

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[1] There are some natural gas fired plants in the province but present energy policy discourages use of this fuel for power generation (211).

Hydroelectric facilities remove land from production permanently as a large reservoir is required if year-round energy production is desired. These are more likely to be located in the unsettled forested parts of the province, such as the Mountain Rapids site on the Slave River (211). But the definitions of agricultural land can change and, for example, as was pointed out in brief 227, it is significant that flooded peat and muskeg lands may have agricultural potential, although that is assumed not to be the case at the moment. There is also concern for the loss of the ecological communities which are found in the valley bottoms (267).

In addition to the actual removal of agricultural land from production, there can be other impacts on the land base from power generation. For example, emissions from thermal plants contain sulphur as well as other chemical precursors of acid precipitation. Sulphur emissions which can be attributed to thermal power plants were said to total no more than 30 percent of sulphur depositions from natural sources (211). It was stated in brief 244 that electric power generation facilities account for only about 15 percent of the total sulphur emitted by industrial activities, with oil sands plants accounting for 26 percent, and sour gas processing plants contributing the remaining 60 percent. While sulphur emissions from power plants in general (211) or from individual plants (94) are not large, sulphur deposition may be locally significant (94, 244). Hearing participants were concerned about acid rain (262) and resulting potential problems such as corrosion (171) and soil acidification (94, 159, 211, 225). However, at present acid deposition is not considered to be a major problem in Alberta (244).

Luvisolic soils, which tend to be naturally acidic, are particularly sensitive to acid deposition but they are also frequently sulphur-deficient (244). In such cases sulphur inputs from acid deposition can have a mildly beneficial effect (244). Most Alberta soils, however, are non-acidic and can receive substantial deposits of sulphur without major changes in soil pH (211, 244).

Several studies on the effects of acid deposition on soils have been recently conducted or are in progress. The Environment Protection Service and Atmospheric Environment Service of Environment Canada have been involved in studies of acid deposition and long-range transport of air pollutants in western Canada. Areas in Alberta which are potentially sensitive to high sulphur deposition rates have been identified. Most of these soils are concentrated in northeast Alberta and have little agricultural capability (244).

Removal of sulphur from emissions has a cost, and it can be substantial, particularly if retrofitting of equipment is involved (211). Fly ash must be disposed of, often by placement in lagoons or abandoned mine pits, and this can lead to concerns about groundwater contamination, so sometimes a clay liner is used (211).

The cooling ponds associated with thermal plants compete with other users for water in addition to using land. However, the impacts are not always negative. For example, in the case of the Sheerness plant the water supply system was oversized, thereby also providing water which can be used for irrigation (57, 211). The Panel also heard that the potential exists to use waste heat from thermal plants for greenhouses (56, 125, 262).

In order to establish a thermal plant, the utility company must obtain the rights to the surface. The process for doing this was criticized extensively, particularly in the area of the Genesee plant (114). Use of the Expropriation Act, or its threatened use (114), can be very disruptive to the social and economic life of the region (114, 262), and there were also objections to the level of compensation received (177). However, it was pointed out that the companies do have a policy of striving for co-operation with the agricultural industry (211). Nevertheless, because of the impacts of thermal power generation, hearing participants suggested locating the plants in remote parts of the province (114, 123), putting greater emphasis upon hydroelectric facilities (171), or developing in situ extraction techniques such as gasification (94).

Industrial Sites — Industrial sites in a rural area can be seen both as problems and as contributors to the local economy. At the public hearings, it was argued that threats by industry to locate elsewhere if it cannot get approval for its preferred location for an industrial plant coerces local governments to approve the industry's request, and that such pressures can work to the detriment of the preservation of good agricultural land (193). Some hearing participants would counteract this by creating a provincial industrial revenue-sharing system (133). It was felt that rural jurisdictions tended to lose proportionally more land to industrial development than do the urban ones (241). Many presenters believed industry should be directed to poorer agricultural lands (42, 59, 70, 183, 190, 195, 196, 197, 263), especially if the industry does not have specific site requirements. Directing industrial development to poorer lands, such as parts of northern Alberta (123, 128), was thought possible through offering industry tangible encouragement to locate in smaller centers on marginal land (267), legislating against industrial development on the better soils when poorer soils are available (55, 104), supporting civic and municipal officials who make the unpopular decisions to site industry on poorer land (190), integrating some land uses as Wainwright has done with gravel pits, sanitary landfill sites, and communication towers (107), and creating satellite communities on marginal lands (30, 70). Criticism was directed at the provincial government for approving industrial sites on good agricultural lands (123) and it was suggested that decisions of this type should be made by a board composed of representatives from industry and government, along with an equal number of landowners who make their living from the land (262).

Plant sites must ultimately be decommissioned, and several presenters commented that subsequent reclamation should be done to at least minimum standards for agriculture (30, 65, 195). One suggestion was made to "reclaim" old industrial sites by bringing in replacement industry (59). Another presenter expressed concerns about decommissioning of sour gas plants, and suggested that a levy per specified volume of gas processed should be collected and put into a fund to clean up after the plant closes (44).

Industrial developments are also considered to provide benefits to an area (195), including the agricultural community (58, 136). For example, some industries provide the opportunity to use waste heat, possibly for greenhouses; these two interests can be considered integrative (56, 94, 125, 262). The presenter for one regional planning commission stated that jurisdictions want the flexibility to accommodate industrial activity (136).

Natural Gas Processing — Much of the natural gas produced in the province is sour and consequently must be processed to remove the sulphur. The technology is not one hundred percent efficient so some sulphur emissions occur; as with thermal plant emissions, these emissions are a concern due to their potential to cause corrosion as well as soil acidification (155). The amount of sulphur input through agricultural fertilization, however, is estimated to be about 10 times that originating from sour gas plants (244).

One hearing participant raised concerns about decommissioning of the Gulf natural gas processing plant near Pincher Creek, since that plant is the first of many that will be decommissioned over the next few years (44). Of particular concern was the degree of site decontamination possible. It was suggested that there be a levy on every cubic foot of processed gas to pay for site reclamation after a gas plant has closed, and that the Panel might consider proposing recommendations to deal with decommissioning of gas processing plants (44).

3.1.4 Resource Extraction

Coal Mines — The amount of land actually disturbed by coal mining is about 3,000 acres out of total coal leases of 30,080 acres. One of the major uses of coal in Alberta is to generate power. For thermal plants, the mining area is the most substantial portion of the land area affected but it also is returned to production the soonest, perhaps three to four years after the initial disturbance, though the reclamation certificate may not be issued for another 10 years after that (211). The quality of the reclamation work to date was criticized (83, 114, 177) and it was noted that the land does not return to agricultural use in all circumstances (88, 177). Nevertheless, the coal industry is confident that it can reclaim agricultural land to a level of productivity at least as high as it was prior to mining (207).

In reclaiming a mine, more than just the soils must be restored in order for agriculture to be feasible. Suitable water supplies, for example, are essential to most farming operations. Coal seams are often aquifers, and effects of coal mining on local groundwater supplies were identified during the hearings (207, 211); it was noted that the quality and quantity of groundwater for several kilometers around a mine can be affected (207).

Oil and Gas Wells — Concerns and comments about oil and gas wells generally fell into three categories during the public hearings: comments relating to the Surface Rights Act and landowner compensation, comments about the impact of oil and gas wells on agricultural land, and comments about reclamation activities.

Among other things, the Surface Rights Act addresses the terms and conditions under which oil and gas operators are permitted to operate on privately owned land. Ownership of land originally meant everything within the established boundaries from the center of the earth to the heavens, including any game upon the land.

When the ownership of land in Alberta changes from the Crown to private hands, the Crown retains the right to the minerals and the right to work the same. When the right to minerals is vested in a different party than the holder of the remainder of the rights, the second party is said to have surface rights; that is, all the land rights excepting the rights to minerals. The right of the minerals owner is dominant and has precedence over the right of the surface owner. This situation can lead to conflict between the two owners, because the mineral owner must use the surface to extract minerals.

Once a licence to extract resources has been received from the Energy Resources Conservation Board, the operator must negotiate with the owner of the land for access rights and other conditions before drilling can begin. If consent of the owner and occupant cannot be obtained, the operator may apply to the Surface Rights Board for a right-of-entry order. Once the Surface Rights Board has issued the right-of-entry order, the owner/occupant may file an objection with the Board within 14 days of receiving the notice. The Surface Rights Board then may hold a hearing, and when a subsequent right-of-entry order is granted, the order describes the portion of the land surface required for the mineral owner's operations and other conditions the Board feels appropriate. The Surface Rights Act states that mineral owners given a right-of-entry order shall pay an entry fee plus compensation to the farmer. If agreement is not reached between the owner and the operator, the Board may have a hearing and order a settlement. Appeals regarding the amount of compensation and the persons to whom the compensation is payable can be made to the Court of Queen's Bench.

During the public hearings, it was noted that entry contracts should stipulate the requirements for reclamation, about which the landowner should be consulted (67). One presenter complained that under the regulations of the Oil and Gas Conservation Act, oil companies must provide the farmer with a copy of the licence for enhanced recovery operations, but often they do not (173).

Comments made to the Panel also related to the amount of compensation paid to the farmer, generally that this amount was too low. Oil companies were described as willing to take advantage of farmers on matters of well-siting, construction practices, and proper compensation when farmers did not have experience in dealing with energy companies (168). The Surface Rights Act was claimed to give energy companies the authority to virtually expropriate valuable farmland (168). It was asserted that gas wells add to the cost of irrigation agriculture, and that the gas companies do not always adequately compensate for those losses (49, 69). One suggestion intended to improve the situation was that the annual compensation paid for wells and access roads by operators be based on an appraisal method of assessment, so that the operators would be more aware of the quality of the land they are using and the effect they have on farming operations (94). Farmers are paid for the damage to the land, but if the land cannot be reclaimed to a condition equal to or better than that existing before the surface disturbance (169), there is a qualitative loss to the agricultural land base. Preservation of good land was deemed to be more important than the financial compensation presently received for damages (169).

Additional comments were made about the types of items that are considered in various appeal mechanisms to the Surface Rights Board. One presenter noted that only matters of compensation may be questioned in the right-of-entry appeal (99). Previously, other requirements such as handling of topsoil could also be addressed, but now there is no jurisdictional authority to deal with extra-compensatory items. The difficulty of getting oil companies to accept right-of-entry orders with conditions attached was also mentioned (108), and seismic crews were criticized for some of their practices (110).

The second major category of comments on oil and gas wells had to do with their actual impact on agricultural operations. About 20,000 acres per year are used by the oil and gas industries in Alberta, though some portion of these lands was noted to be still in production (99). The presenter of brief 104 stated that from 1976 to 1980, 26 percent of all removals of land from agriculture were for oil and gas wells and that the majority of the new well sites were located on CLI Class 1 to 4 lands.

Briefs presented in northeast Alberta paid special attention to the intrusions of the heavy oil industry on agricultural land. Northeast Alberta could lose proportionately more farmland than other areas in the province because of the greater number of well sites needed to extract heavy oil (104). It was estimated that nearly 40 percent of the agricultural land base could be removed from production in heavy oil areas (99). One estimation was that the economic loss in the Vermilion area alone could reach $9 to $13.5 million annually (169); proper planning to reduce the area for well sites per section from 239.4 acres to 34.5 acres, would concomitantly reduce the injurious effects on agricultural production (169). It was noted that in some cases the well densities in heavy crude areas are high enough that individual cereal farms could be made unviable (169). It was further pointed out by one speaker in northeast Alberta that cattle which have gained access to condensate spills showed reduced conception rates and later calving (108).

The Panel's attention was also drawn to the increased impact that enhanced oil recovery would have on agriculture (155); as extraction technology improves, wells remain in production longer (15, 49). Many briefs presented in northeast Alberta appealed for the use of directional or slant drilling as a means of reducing the impact of the oil and gas industry on agricultural land (104, 106, 108, 109, 168, 169).

The effect of oil and gas operations on irrigation farming was described in several briefs. The Eastern Irrigation District (EID) told the Panel that approximately 2,300 well sites were leased within the district, affecting about 8,000 acres (49). The EID was especially concerned about the increased lengths of time that oil wells may be in operation as resource extraction techniques improve. They suggested that there was need for better co-operation between the Irrigation Districts and resource industries to establish programs for the most efficient use and development of land; this would avoid concentrations of oil and gas wells that are too dense to allow for economic farming of irrigated land. Directional drilling was suggested as a means to reduce the effect of oil and gas exploration in the EID. Other hearing participants commented on the placement of extraction equipment in irrigation areas; for example, an oil well was drilled at the center point and reservoir of a center pivot system (69). It was suggested that wellheads and pipeline valves be placed below the ground (54), preferably in the corner of a quarter section (48) and that above-ground installations should be grouped to reduce fragmentation (48).

Several other suggestions were received about locating oil and gas wells in ways that would be less intrusive to agriculture. It was suggested that wells should be adjacent to property lines (40, 169) and road allowances (40, 76, 109) and never in the middle of a quarter section. Although a development permit from a municipality is not necessary, once the ERCB has issued an approval, county regulations requiring setbacks are often responsible for the location of well sites in fields rather than along fencelines (104). It was also suggested that wells might be drilled in dry slough beds (76). That there is not enough flexibility in locating wells (168) is probably an accurate summary of farmers' complaints. One presenter complained that wells are sited after exploratory wells have proven productive, and suggested as an alternative that the siting of many wells should be preplanned before the exploratory wells prove productive (168).

One specific concern about well site location was the amount of land taken up by access roads. It was suggested that no farmland would be lost to access roads if the target areas were located in legal subdivisions 5, 8, 9, and 12 (138). A shift in the location of the gas target areas from the central 250 acres of a section was suggested to avoid creation of long or L-shaped access roads (94). This speaker also stated that Alberta Transportation's policy of limited access to highways causes oil companies to use up excessive amounts of agricultural land for access roads.

Objections to the use of potable surface water and groundwater for enhanced oil recovery were raised by the presenters of briefs 106, 108, 168, and 173. The general right of access by oil companies to the water was not denied (173), but in view of the considerably greater quantities of water used, it was recommended that the use of water by the companies take second place to use by farmers (173). The ability of the Department of Environment to monitor withdrawals of water was questioned in brief 108, in which it was alleged that industrial withdrawals of water from wells and from the Battle River occur without industrial permits. The lack of groundwater monitoring to ascertain the effects of industrial withdrawals was also commented on in brief 173. Evidently, industrial groundwater withdrawals are from the same aquifers used by farmers (173), and as a result, some farmers have had to drill new wells (168). One hearing participant claimed that sufficient saltwater is available for oilfield injection, but many companies refuse to use it since corrosion-resistant lines are required at greater cost to the company (108).

The Canadian Petroleum Association (15) countered that the petroleum industry has provided a solid backdrop of economic strength against which agriculture could develop, especially in frontier agricultural areas (15). The effect of well sites on the agricultural land base was minimized by virtue of the temporary (generally 25-45 years) nature of land leases, and by virtue of the return of most of the well leases to agricultural production once drilling is completed. The petroleum industry anticipated that many well sites would be returning to agricultural production at about the same time it will be critical to have agricultural land, that is, in the next three to four decades (15).

The third major topic of discussion regarding oil and gas wells focused on reclamation. It was acknowledged that the reclamation work being done by energy companies has improved in recent years (19, 67, 177). However, other hearing participants voiced concerns about the reclamation process. There were specific concerns about the handling of topsoil (16, 99, 155, 168, 169), since in some cases, apparently no topsoil is saved for reclamation purposes (169), and when topsoil is saved, it was noted that the soil should not be replaced on the well site too soon, that is, before rig work is complete (155). Not mixing the topsoil with subsoils during scraping, and not covering access roads with rocks and gravel were suggested as ways of facilitating reclamation (168, 169). One presenter advocated immediate use of the topsoil by spreading it over an equivalent acreage of land, or by respreading it over the portion of the well site not actually needed for hydrocarbon extraction (99).

Another specific reclamation concern was the effect of sump disposal on-site. Not all fluids or sludges are treated, and when the sump pits are not properly reclaimed, the sump fluids can be squeezed back to the ground surface (155). Crop production is then severely impaired. It was proposed in brief 155 that, at a minimum, the sludge left after the sump fluids have been drained off be tested for toxicity and that on environmentally sensitive sites the sump fluids be trucked away for disposal.

The use of soil sterilants to keep well sites free of weeds (106) is another potential reclamation problem, though the use of these chemicals is becoming less common.

Although the Land Conservation and Reclamation Council specifies that well site development is to proceed in a good "workmanlike" manner, evidently a wide range of practices actually exists (99). In part, this was alleged to occur because the heavy equipment operators are not always aware of procedures which can reduce the negative effects of well site construction (169) and because no one is present to direct or supervise construction practices (108).

Alberta Environment's requirement that land be reclaimed to a capability equal to or better than that which existed prior to disturbance has been in effect since 1978. The ERCB and Land Conservation and Reclamation Council guidelines for reclamation were thought to be adequate to prevent land misuse if they were adhered to (108), but in some cases it was claimed that reclamation certificates were issued without inspection or when reclamation was unsatisfactory to the landholder (67), when the land was not being restored to original agricultural productivity (108), or even when improper reclamation seemed evident (67). One suggestion was that reclamation should be monitored by qualified people (169), and the presenter of brief 169 thought there might be some merit in having the local Agricultural Service Board involved in reclamation assessment. Because the development permits are issued to the energy companies, they are responsible for reclamation regardless of the work the contractors do (247). If landowners are tenacious in insisting that a better job of reclamation be done, the companies will do it (67, 108). However, farmers should not be left with the responsibility of being watchdogs of the land (108, 168).

Landowners have 30 days after a reclamation certificate is issued to complain to the Reclamation Council but, as was suggested in brief 108, this is probably not enough time to assess the productivity of the reclaimed land, and even after a complaint is registered, companies can delay further reclamation work. Under the Surface Rights Act, landowners have 90 days to register a complaint, but this probably is still not enough time to dispel the concerns identified in brief 108.

A number of briefs addressed means of ensuring more satisfactory well site reclamation practices. It was advocated that:

> *...reclamation costs should be borne by the developer as a condition of Energy Resources Conservation Board approval, and this approval should only be granted when the developer can prove reclamation possible, the method of reclamation, the cost of reclamation and the developer's ability to finance the project including the reclamation work* (30).

Other presenters also indicated that the cost of reclamation should be borne by the operator (169, 225), and legislation to ensure financial guarantees for reclamation was proposed in brief 70.

Several hearing attendees (108, 168, 169) advocated penalty systems for unsatisfactory reclamation, with penalties to be contributed to a reclamation fund (108). Another participant suggested that there should be economic deterrents to the petroleum companies at least equal to the loss experienced by farmers due to declines in soil quality and loss of crop production (169). Another measure was proposed, that oil companies not abiding by the regulations should not have their licences renewed (168). One speaker suggested that problems with reclamation could be prevented by consulting with the landowner before the certificate is issued (67). The petroleum industry (15) stated that modern techniques and voluntary enforcement of good oil field practices enhance its ability to reclaim lands.

Hearing participants who were concerned about the impact of oil and gas extraction on the agricultural land base made other suggestions for improvements. Better planning was suggested as a means of decreasing the impact of well sites on agricultural land. It was claimed that when oil and gas fields are put into production, often there is no initial planning of the most feasible designs for future expansion (108). As a consequence roads, pipelines, and powerlines are inefficiently laid out with respect to agricultural land use (108). Very early in the exploration stage, even as a precondition of being granted a licence from the ERCB, a plan describing the pattern of extractive wells should be made (168). Reclamation, especially topsoil handling and sump fluid disposal, should also be addressed (155, 169). Specific guidelines for developing well sites and access roads which would preclude the different procedures now used by companies (99) could be part of the planning process.

Farmland could be conserved by avoiding duplication of facilities, for example, by drilling several wells from one pad (168) and by placing facilities such as wells and pipeline pumping and metering stations owned by different companies in close proximity (48). Shortening the time period between the initiation of a project and the reclamation of a well site was also suggested as a way of decreasing the impact of the oil and gas industry (108). Another was to permit temporary non-agricultural uses of the land only on lands with low agricultural capability (30). Allusions were made to the fact that many projects in the energy industry are not bound by the Planning Act and regulations (96, 273), suggesting that conformity to the Act and regulations is desirable, and that agriculture should be ranked a higher priority use.

It is apparent from the preceding discussions that matters relating to reclamation of surface disturbances were of concern to many hearing participants. To deal with many of these concerns, the Panel recommends "that the rural municipality be given the responsibility for reclamation not dealt with under the Land Surface Conservation and Reclamation Act's regulated surface disturbances provisions. This proposal is not intended to replace direct negotiation between the applicant and the landowner for right of entry."

When land in a rural municipality is subject to disturbance and is required to be eventually restored to its original condition, a municipal inspection and reclamation officer should have a role similar to that of a development officer, based on a concept similar to the development permit system, namely:

a) that a development and reclamation plan setting out the purpose, location, and type of disturbance, together with a description of handling the land, inclusive of replacing the disturbed soil, be submitted,

   i) for pipeline rights-of-way, exploration sites, and those parts of the original sites not required after production commences, and

  ii) for production sites after production ceases and the site is to be permanently abandoned;

b) a development and reclamation approval would be issued to the applicant when the plan was deemed acceptable, in accordance with the requirements of the Land Surface Conservation and Reclamation Act and any local regulations approved by the Land Conservation and Reclamation Council;

c) the applicant for the reclamation certificate would be bonded during the term the reclamation certificate was outstanding for (a)(i) above;

d) periodic inspections would be carried out during the period when the disturbance occurred to insure that the reclamation plan was being adhered to;

e) the permit fee collected by the municipality would be based on the costs to process the plan, test soils, and conduct periodic and final inspections;

f) the reclamation certificate would certify that the impact of the disturbance had been mitigated as much as possible.

This proposal would do away with the present centralized system that during the public hearings was claimed to be too complicated, slow to respond, and not capable of looking after specific local concerns. This system would provide the landowner with direct local access to a person who would be knowledgeable about the procedures. Rural inspection and reclamation officers should have access to study courses and seminars to ensure that high-quality administration would occur.

Appeals of decisions of the inspection and reclamation officer to the municipal council and the courts should be available to both the applicant and the landowner.

Reclamation is but one aspect of the overall impact that regulated surface disturbances can have on a locale. To address other concerns the Panel recommends elsewhere in this report that the effects of industry on agriculture be more thoroughly researched.

3.1.5 Agriculture and the Rural Environment

The rural land base in Alberta can accommodate many uses. One of the important non-agricultural uses is recreation. The value of farmland for recreation is partly related to its capability for providing fish and wildlife habitat, which in turn is related to the use of the same land base for agriculture. Agricultural activities can alter the capability of agricultural land to support wildlife, just as some wildlife can have an impact on agricultural activities. This section of the report looks at the relationship between agriculture and the broader rural environment, as well as the effects of these factors on recreation.

Agricultural land has traditionally been a setting for many types of outdoor recreation. Recreationists spend millions of dollars every year in Alberta to engage in a variety of outdoor pursuits, and although attempts have been made to measure the economic significance of outdoor recreation (fish and wildlife-based activities in particular [Glasgow 1982]), it is difficult to determine the extent and economic impact of those activities which occur on privately owned agricultural land. In addition to the economic impact, the opportunity to engage in wildlife-related recreation contributes to an improved quality of life for both urban and rural people (151, 158, 164).

An increasing urban population means a growing demand for outdoor recreation. Since agriculture and outdoor recreation are both extensive land uses, the activities can often be compatible. Problems and conflicts which do occur are usually caused by careless users of the land base rather than the activities themselves, but some hearing participants stressed that with proper management and co-ordination, agriculture and recreation could co-exist on the same land base (215, 268).

The types of outdoor recreation activities which most frequently occur on agricultural land have been placed into three broad categories: use of off-road vehicles, non-consumptive forms (hiking, cross-country skiing, bird watching), and consumptive forms (hunting and fishing). Off-road vehicles, including snowmobiles, have been criticized for the damage they cause to the environment generally as well as to farmland and crops (176), and it was suggested at the public hearings that specific areas be designated for the use of people who wish to participate in this form of recreation (19, 39).

Consumptive and non-consumptive activities per se tend to have less impact on farmland. As long as permission for access is obtained from the landowner and the users behave in a responsible manner, these recreational uses tend to be compatible with agricultural use. In fact, it was pointed out that hunters can actually assist farmers in reducing their crop losses due to wildlife (62). In southern Alberta, water-based recreation activities are often associated with irrigation. Reservoirs, although constructed as part of a water delivery system for agriculture, provide recreational opportunities, while other components of this water distribution system provide habitat for fish and waterfowl, and in some areas the vegetation which has grown up along leaky canals provides shelter for game birds (51).

Farmland often provides good habitat for fish and wildlife, and while many farmers enjoy the presence of wildlife on their land, they may be reluctant to permit others to have access for the purpose of hunting or fishing. Concern about firearm safety is a major reason for denying access to hunters.

Most people who addressed these issues at the public hearings agreed that permission should be obtained from the landowner prior to access, and that the existing right of landowners to grant or deny access to privately held property is fair and reasonable (30, 35, 46, 70, 125, 127, 176, 181, 185). One presentation focused on concerns of landowners near urban centers, commenting that trespass is a common offense which takes up a great deal of landowners' time (36); the fact that this occurs so frequently was attributed to inadequate legislation, insufficient supervision and enforcement, and lenient penalties (35, 36, 176).

An obvious concern of landowners is the possibility of damage to their property, livestock, crops, or families through carelessness or deliberate vandalism by recreationists. Fires (38), damage by snowmobiles (176), and indiscriminate use of vehicles generally (19, 181) were all cited as problems caused by irresponsible or careless recreational users. If rural crime caused by recreationists or other persons is increasing, bolstering rural police forces will be necessary (13).

The concept of an access fee was suggested by several hearing participants as a means of relieving some of the recreational pressure on private land, controlling access, and providing landowners with some means of compensation if any damage is done (30, 68, 70, 158, 160). Others, however, did not think hunting or access fees were the answer (51, 62, 181).

Maintenance of habitat on agricultural land ultimately benefits hunters and anglers but can also provide aesthetic and practical benefits to farmers. Indeed, many farmers recognize the value of wildlife and provide habitat cover along fencelines and retain wooded areas on their property (30, 116). Much of the land in Alberta which is productive for agriculture has high capability for fish and wildlife, and efforts should be made to encourage the co-existence of both land uses (51, 89, 92, 120, 121, 143).

Unimproved land is often particularly good habitat, with woodlots, sloughs, and other natural features offering food, water, and cover to various species. Much of this land is left in an unimproved state because it is uneconomical to improve, given present levels of technology and high costs of production. Though such land is marginal for agricultural production, it is productive in terms of its capability for wildlife (32, 92, 164, 181), although it was suggested that some lands presently covered by sloughs could be cultivated (213).

The Panel was told that expansion of agriculture in central and northern areas, particularly near the Green Area boundary, could diminish the land base required for trapping, which provides a livelihood for a significant number of local people, particularly natives (6). Resident trappers on private land can supplement other income through trapping, and the wild fur industry benefits Albertans generally since each harvested pelt brings in a royalty to the Provincial Treasury (131). In the 1983-84 season, $5.7 million worth of furs were exported from Alberta, obtained from 2,973 registered trappers and 4,987 resident trappers (Alberta Energy and Natural Resources 1984). Resident trapping activities in agricultural areas can also help to control beavers and coyotes. It was felt that with appropriate planning of agricultural settlement, trapping could remain a compatible land use (131).

Despite the potential for compatible use of the same land base, conflicts do occur; these are usually due to intensification of agricultural activities resulting in loss of habitat and competition with wildlife for food or water (139, 143, 158, 164, 181, 224, 267, 276) or to problem wildlife which damage or destroy crops and livestock (62, 177). When land is improved for farming purposes by clearing or draining, for example, fish and wildlife habitat as well as the natural landscape diversity tends to be reduced (164, 276). Inadequate or inappropriate fencing can lead to streambank erosion and degradation of fish habitat through increased siltation (158). On the other hand, when agriculture and wildlife and fisheries habitat are carefully planned together, it is possible to protect and enhance both agricultural and wildlife activities (51, 93, 120, 121, 143, 276).

A number of people at the public hearings expressed concern about habitat alteration and the loss, due to agricultural activities, of natural areas such as wetlands and native grasslands (32, 33, 48, 205, 210, 228, 267). Specifically, concern was raised about the breaking and subsequent tilling of native grasslands (32, 48, 228), and the loss of wetlands which are important to the maintenance of waterfowl populations (33).

Destruction of habitat significantly contributes to species extinction (267), and reductions in species diversity of ecosystems can also occur through more selective forms of ecosystem manipulation (32, 276). Chemical brush and weed control is one form of selective ecosystem manipulation which received comment at the hearings. Concern was expressed about the safety of such chemicals and their effects on wildlife and the environment (20, 34, 92, 205, 267). In some cases, it was pointed out that stronger chemicals may be required in order to limit the growth of aspen which is encroaching on grazing land in some parts of the Special Areas (54). Others commented that overgrazing or livestock confinement can reduce the natural diversity of prairie ecosystems (32, 228, 276). In any case, without checks on such disruptions the effective functioning of ecological processes may be impaired (267).

The loss of shelterbelts, clearing of woodlots, and draining of sloughs all reduce wildlife habitat. All of these things can provide some benefits to the farmer as well as supporting wildlife (121, 176, 276). They break up the landscape and thus help to control erosion, and sloughs have the added benefit of stabilizing runoff and providing water for livestock. However, they also create obstacles which must be farmed around, and it is usually for this reason that clearing or draining is carried out. It was pointed out that rising costs of production and concomitant declining net returns pressure farmers to increase production by draining sloughs, clearing bush, or making other such improvements (205, 276). New techniques being developed for farmland that was previously unusable also tempt farmers to improve the land when they are facing cost-price squeezes (32). Economic predicaments of farmers notwithstanding, the Panel was advised that economic concerns should not take priority over the integrity of the environment (59), and that lands marginally productive for agriculture should be left as native habitat (32). In a similar vein, the Archaeological Society of Alberta expressed concern about the destruction of historical sites as farms are expanded and more land is improved; they recommended that such sites be classified on a priority basis in an attempt to prevent their loss to society in the future (275).

Presenters suggested that these objectives could be accommodated within the context of a regional environmental protection policy prepared by the regional planning commissions (109). Planners were commended for advocating balanced use of lands and the protection of natural environments (181), and it was suggested that the integrated planning approach to resource management would reduce land use conflicts and help preserve wildland areas (32, 276). The establishment of regional environmental protection policies might also mitigate criticism that, to date, government has held a cavalier attitude to wildland protection (205).

Management and use of water for agricultural activities can also affect the larger environment. A few briefs at the public hearings addressed the environmental implications of interbasin water transfer, concluding that such schemes are presently unsound, both environmentally and economically (227), and that studies on environmental, social, and economic impacts are needed before such diversions are considered (70, 168). On-farm activities affect water regimes too; loss of tree cover causes depletion of groundwater, and installation of drains and ditches often expedites water loss (221).

A lack of sufficient controls on drainage has resulted in loss of land through erosion and salinization (64). Sedimentation resulting from erosion causes difficulties such as flooding, increased costs for obtaining potable water, decreased life spans for power reservoirs, and increased costs for maintaining roads and highways when ditches become filled with eroded soil (218). It was stated that over 50 percent of eroded sediment in streams is from agricultural land (21).

Other concerns about water quality were related to chemicals introduced as a result of agricultural operations. Drainage of saline water into watercourses (45), and pollution by agricultural biocides and/or fertilizers were the major water quality issues expressed at the hearings (70, 92, 103, 126, 133, 161, 262, 276). It was suggested that farmers should practise better soil conservation to avoid problems with runoff (70, 161, 276).

Waste management was not yet thought to be a serious problem with intensive agriculture operations (133). Nevertheless, careless control of animal wastes by some farmers was identified as a source of water pollution (168), and firmer control of runoff from feedlots was recommended (121). Rules and regulations governing the disposal of chemicals and animal wastes were acknowledged to exist, but once the pollution has been noticed the damage has been done (222).

It was suggested that more farmers be made aware of the Certificate of Compliance program applying to the Confinement Livestock Facilities Waste Management Code of Practice, and that the certificate become a planning instrument with legislative backing (16). The Certificate of Compliance, which is issued jointly by Alberta Agriculture and Alberta Environment, is a statement indicating that the operator has complied with all the regulations at a level of technology or management within the guidelines of good practice. Currently participation in the program is optional. The Certificate of Compliance program is partly intended to aid land use planning by providing minimum distance separations between confinement livestock operations and non-agricultural uses of land.

Manure from livestock operations is not the only cause of degraded water quality in some Alberta rivers. Municipal sewage, sewage lagoons, and sewage in roadside ditches (often resulting from untimely release of lagoon contents) were also mentioned (30, 217). It was suggested that environmental problems might be avoided while at the same time economic benefits could be realized if treated sewage could be safely applied to farmland (27, 28, 82, 179, 239).

Although many of the situations and activities just described can affect the environment, and more specifically fish and wildlife, conflicts which occur between fish and wildlife and agriculture do not all originate with the agriculture sector. Another challenge to managers of the two land uses is to minimize wildlife damage to crops and livestock. Numerous wildlife species can cause damage to agricultural crops and livestock (22, 62, 68, 87, 116, 121, 152, 177). Crop damage often occurs during fall and winter following the harvest; waterfowl eat and trample cereal grain crops (especially in cool, wet weather when swaths are down for a long time), while some ungulates and birds may feed on forage and cereal crops. Beavers can create floods which damage roads as well as crops, and carnivores such as bears, wolves, and coyotes will prey on farm animals (Glasgow 1982).

Some of these problem animals can be controlled through hunting or trapping by farmers themselves, under appropriate authorization. Fish and Wildlife staff and/or Agriculture personnel may also be involved, but several hearing participants mentioned that finding the right agency or getting some action could be time consuming (22, 116, 120). Compensation funds, discussed below, exist to cover a variety of damage to crops and livestock caused by predators, waterfowl, and ungulates.

Responsibility for dealing with problem or nuisance wildlife rests largely with the Department of Energy and Natural Resources, with the exception of agricultural pest and coyote control in the White and Yellow areas, which is the responsibility of Alberta Agriculture. Programs to control crop damage by migratory birds involve the Canadian Wildlife Service as well as the Fish and Wildlife Division of Alberta Energy and Natural Resources. Prevention programs such as the use of scare devices, fences, or bait stations, are the most desirable means to prevent wildlife damage to crops and livestock but such methods cannot always be used. Trapping, snaring, or shooting may be necessary to control some predators, while special hunting seasons and increased bag limits can be used to control ungulates and waterfowl (Glasgow 1982).

When wildlife does damage crops or livestock, the landowner can seek compensation for the loss. Compensation programs presently exist for shot livestock, livestock killed by predators, beeyard damage by bears, and crop damage by ungulates, waterfowl, or bears. Depending on the program, funding is provided by Alberta Agriculture, the Fish and Wildlife Division, and the Wildlife Damage Fund through a small levy on each wildlife certificate (hunting licence) purchased by hunters. The federal government also contributes funding for waterfowl damage prevention and compensation programs; this funding is collected from the sale of Migratory Game Bird Permits. Several people at the public hearings suggested that compensation to landowners should be maintained or increased (22, 121, 267), but it was also pointed out that such assistance has been one-sided; compensation is paid to farmers incurring losses due to wildlife, but there has been little support to assess how agricultural activities may affect fish and wildlife (181).

The County of Red Deer Landowners Habitat Compensation Project was begun as a three-year pilot project in 1978, then extended for two more years, and is now being evaluated to assess the possibility of expanding it to other areas. The project was developed by the Fish and Wildlife Division in consultation with the Department of Agriculture and the Alberta Fish and Game Association; it was funded through "Buck for Wildlife" and the sale of angling licences and Resource Development Stamps on all Wildlife Certificates.

Several wildlife options were developed for this program based on the use of tax incentives, fencing, pheasant rearing, and signs, and the acreage involved could vary; the fisheries option was an extension of a current province-wide stream bank protection program. In the case of wildlife options, the landowner agreed not to clear, burn, spray, or otherwise destroy the wildlife habitat designated in the program in order to receive compensation. More than 80 landowners and 11,000 acres have been involved in this program to date (181), and there is considerable interest in the county in seeing it extended (181, 192).

In general terms, there was support at the public hearings for the concept of compensating or encouraging in some way those landowners who preserved habitat on their property (51, 121, 158, 178, 181, 267, 276). Ducks Unlimited, a privately funded organization, also assists landowners to retain and develop habitat for migratory birds, as well as doing inventory and mapping of wetland areas.

As prime farmland in Alberta is lost to urban and industrial development, land with lower agricultural capability, particularly in the north, is being cleared for cultivation, although some of this land is very important for fish and wildlife production (132). The possibility of regulation to control some aspects of private land use where the natural environment is being ignored was raised in briefs 181 and 210. In some cases, farmers destroy wildlife or habitat through lack of information. Therefore, it was recommended that Alberta farmers should be made aware of all aspects of regulations regarding wildlife (267). It was also suggested during the public hearings that for major planned projects on agricultural land (such as clearing and draining) or on public land being released for agriculture, advice and supervision be obtained from Fish and Wildlife Division biologists (164, 267).

Frequently there are situations in which benefits can accrue to both agriculture and wildlife interests by proper assessment and planning in advance of decisions actually being made. For example, there are numerous areas where because of topography, the nature of the soil, or the need to preserve the water table or to prevent wind and water erosion, it would be advantageous to maintain native habitat. In some instances, this might be accomplished by permanent exchanges of land, with some patented land reverting to the Crown, and some Crown land going into private ownership. Such actions are presently underway in the Special Areas and if handled with care could result in a permanent improvement to land use patterns. This process could be assisted if it were possible to break away from the rigid range-township-section form of parcelation to provide for property lines that, for example, followed the top of river breaks, or excluded coulees and sand hills.

To facilitate this process, the Panel recommends "that the Planning Act and Regulations be amended to provide for the implementation of rural replotting schemes." Many situations could be assisted by replotting property boundaries to be more compatible with topography, drainage, soil condition, and physical features such as rivers, railways, etc. Certain lands are so subject to erosion or degradation that they should not be used for agriculture. Under these circumstances the most equitable solution would be to enable these lands to be exchanged or purchased by the government for permanent environmental reserves. In addition, replotting would enable rural municipalities and the provincial government to:

a) reorganize land ownership and road systems within drainage districts so as to reduce the necessity for drainage structures and to reduce erosion;

b) create special parcels in recharge and saline seep areas;

c) facilitate surface water management and retention programs to encourage and enhance water supply, control erosion, and create wildlife habitat;

d) reorganize areas where there are public lands suitable for cultivation and private lands that should be planted to grass or conservation cover in perpetuity.

The ability to replot should be available to Soil Reclamation Districts (described in a later recommendation in Section 3.3.6) as a tool to achieve long-term soil conservation objectives. Since it could also be useful to rural municipalities in other land use situations, the authority for replotting should be provided to rural municipal councils as it presently is to urban councils. Rural municipalities could then undertake replotting on behalf of Soil Reclamation Districts, as well as on their own initiative when necessary.

Other recommendations should provide protection to the environment and preservation of wildlife habitat while avoiding erosion and soil degradation as the agricultural land base becomes more intensively used. These include a recommendation to develop an agricultural land use classification which would identify lands prone to erosion and soil degradation under normal farming practices (see Section 3.3.6) and a recommendation for an agricultural development permit, which would either retain cover on especially sensitive soils or require special handling of problem soils, as identified by Agricultural Service Boards (see Section 3.3.6).

A recommendation by the Sparrow Committee (Standing Committee on Agriculture, Fisheries, and Forestry 1984), which is endorsed by the Panel, to provide for "full quota entitlement, at the "bonused" level of seeded acreage, to those remnant farmlands considered of marginal value for agriculture" would remove an incentive to utilize lands which should remain unbroken or uncleared (see Section 3.3.6).

3.2 Public Land

Public land makes up a substantial portion of Alberta's land base, with land under provincial or federal jurisdiction amounting to about 72 percent of the total area of the province (Table 33). Responsibility for the management and administration of provincial public lands, forests, wildlife, and energy and mineral resources rests with Alberta Energy and Natural Resources. Ownership and management responsibilities were transferred to the province in 1930 from the federal government, and for administrative purposes the province has since been divided into three areas, known as the White, Yellow, and Green areas.

The Green Area (generally the forested area of Alberta) was designated in 1948 by Order in Council 113-48. Lands in this area were withdrawn from settlement at that time for several reasons:

1) they were unsuitable for agricultural pursuits and it was desirable to prevent random settling and squatting;

2) they had potential for establishment of a valuable forest cover;

3) while no action should be taken to impede or restrict development, particularly for the recovery of minerals, it was considered to be in the public interest to restrict disposition of provincial lands.

Consequently,

> *...any disposition of the right to use the surface of the Provincial Lands comprised within those areas, shall be solely for commercial and industrial uses as the Minister may, in his discretion, consider to be in the public interest.* (Alberta Gazette 1948: 182)

The effect of Order in Council 113-48 was to separate those lands on which settlement would not be permitted from the rest of the province. Subsequently, the portion of Alberta which was settled initially and in which agriculture was the major land user was designated as the White Area. The remaining portion in the Peace River region, which came to be known

Table 33. Total area of Alberta classified by tenure, 1984

	Square Kilometers	Square Miles	% of Total
Federal Public Lands			
Indian Reserves	6,566	2,535	
National Parks, Research Stations, etc.	63,056	24,346	
Total	69,622	26,881	10.5
Provincial Public Lands			
Parks, Wilderness Areas	7,092	2,738	
Metis Settlements	5,053	1,951	
Special Areas	12,963	5,005	
Land Under Disposition	31,365	12,110	
Non-Settled Land (mainly forests)	337,000	130,117	
Vacant Public Land (in Yellow and White Areas)	15,022	5,800	
Total	408,495	157,721	61.8
Privately Owned Land	183,068	70,683	27.7
Total Area of Alberta	661,185	255,285	100.0

Source: Alberta Energy and Natural Resources 1984

as the Yellow Area, differed administratively from the White Area only in that public land was also available for homestead sale dispositions. Demand for homesteads existed and this designation enabled the orderly settlement of the expanding agricultural frontier. The Yellow Area is considered to be in transition from mainly public ownership (which it was initially) to mainly private ownership, and when the area is settled and the land predominantly in private hands it will presumably become part of the White Area. Recent amendments to the Public Lands Act have, among other things, abolished future homestead sales, thereby removing the only administrative difference between the White and Yellow areas.

In 1968, Ministerial Order 26/68 redefined the Green Area to facilitate integrated management of resources. The forest lands would be managed for multiple uses including timber production, water, recreation, fish and wildlife, and industrial development but would not be available for agricultural development other than grazing (Alberta Gazette 1968:647). This is in keeping with the intent of the original Order in Council as far as agriculture is concerned. Other agricultural activities are permitted on public lands in the

White and Yellow areas, but to the extent possible, provincial public lands in Alberta are managed for multiple use purposes, under the Public Lands Act.

Assessment and evaluation of land to determine the most appropriate use(s) involve co-ordination between four divisions within Alberta Energy and Natural Resources as well as input from other agencies and departments. Within Energy and Natural Resources, the Fish and Wildlife Division and the Resource Evaluation and Planning Division are generally involved in the planning stages while the Alberta Forest Service and the Public Lands Division have input to planning activities as well as management and administrative responsibilities. Part of this evaluation process has been the development of Integrated Resource Plans; these identify appropriate land uses and constraints for the small portion of the province's land which is covered by these plans. Integrated Resource Plans are discussed in more detail in Section 3.2.5 of this report.

The boundaries of the Green, Yellow, and White areas are not permanent, and in fact have been redefined a number of times since the original Order in Council delineated the Green Area. All boundary adjustments must be finalized by Ministerial Order of the Associate Minister of Public Lands and Wildlife. Land suitable for agricultural disposition can be removed from the Green Area in one of three ways: (1) an individual can apply for vacant public land; (2) after consideration of demand, availability, and suitability of land in an area, the Public Lands Division can decide to open new land; and (3) the Integrated Resource Planning teams identify, through their ecological land surveys, land with agricultural capability. Transferring land to the Green Area is often done through Integrated Resource Plans. Since 1948, boundary changes have amounted to a net transfer of some 10,000 acres from the White and Yellow areas to the Green Area (Thompson 1981b).

In the Green Area, the Alberta Forest Service is the management agency, while the Public Lands Division is primarily responsible for management of public land in the White and Yellow areas. The management responsibilities of these two agencies differ due mainly to the difference in priorities and types of activities in the management areas.

> *The basic objective of the Alberta Forest Service is to manage the Province's forests to ensure a perpetual yield of forest products and benefits while maintaining a forest environment of high quality.* (Alberta Energy and Natural Resources 1981:4)

The Forest Service also has responsibility for reforesting areas destroyed by fire and responsibility to oversee reclamation following resource extraction in the Green Area. Livestock are grazed in the Green Area subject to the approval of the Forest Service, but the only dispositions actually issued by the Alberta Forest Service are Forest Reserve Grazing Allotments.

The Public Lands Division issues all other dispositions authorizing the use of public lands for a specific and appropriate purpose. However, the responsibilities of this agency are largely administrative, since the actual management of the land is usually the responsibility of the disposition holder. There are various conditions attached to both farmland dispositions (which permit cultivation) and grazing dispositions, some of which were discussed at the public hearings. A number of people expressed some dissatisfaction with the present conditions (which will be discussed later in the report in more detail); in the Yellow Area these concerns often related to the allocation process, while in the White and Green areas they focused more on the rights and obligations of the disposition holder.

The decision to retain a large portion of the province in public ownership has clearly made major demands on the system of planning, allocation, and administration of these lands. Public lands can be used for a variety of purposes, and land use priorities are established based on factors such as environmental, physical, and economic constraints. Once these priorities are established, land may be allocated on a temporary or permanent basis for uses which include agriculture, forestry, industry, recreation, and resource extraction. These allocations are carried out through the issuance of dispositions which authorize the use of public lands under various agreements such as sale, lease, permit, and licence. Those land uses which have a direct impact on maintenance and expansion of the agricultural land base are agricultural dispositions and surface rights dispositions for mineral development, with timber dispositions indirectly having an effect in the frontier areas.

Although northern expansion of agriculture involves the use of public land, that issue and the concerns raised during the public hearings are discussed in detail in Section 4, which considers agricultural expansion in northern Alberta.

3.2.1 Agriculture on Public Land

Eligible individuals who are Canadian citizens and at least 18 years of age can apply for an agricultural disposition; as well, Canadian corporations in which a specified majority of shares is owned by Canadians are eligible for some types of agricultural dispositions. All dispositions in the White and Yellow areas are handled by the Public Lands Division of Alberta Energy and Natural Resources with similar procedures for application and processing.

Public lands are made available (that is, posted) for disposition through one of the three methods identified in the preceding section. The land is assessed prior to posting to determine its suitability for agriculture. When land is posted, notices to this effect are sent to all people who own land within two miles of the land in question, and to people who have expressed an interest in the land during the preceding 10 years. When land is made available in new settlement areas, the radius within which landowners are notified is increased to 10 miles from the posted land. The posting period is normally 30 days during which time numerous applications are usually received.

After their eligibility is confirmed, applicants are interviewed by field staff (usually an agrologist) to assess their needs and suitability to be awarded land in relation to competing applicants. Following evaluation of all applications, the agrologist forwards to the head office in Edmonton a report and a recommendation on awarding the land. Based to a large extent on this recommendation, an interim award of the land is made. Priority in the allocation of public lands for agriculture is given (a) to local people already engaged in farming who require additional land to make up an economic unit; and (b) to the establishment of new farm units, firstly to local people and secondly to non-local people who can demonstrate that they have the necessary resources and expertise to have a reasonable assurance of success and who intend to become primarily engaged in farming (Alberta Energy and Natural Resources 1981).

Unsuccessful applicants have 30 days in which to appeal an interim decision. All appeals are submitted to the local Agricultural Development Committee for consideration. Based on the appeals heard and their local knowledge of the situation, the ADC can recommend that the interim award be upheld, or that the disposition be awarded to one of the applicants, or that the land not be allocated to anyone; the Public Lands Division, however, has responsibility for making the final decision (Alberta Energy and Natural Resources 1981).

In some areas, a draw procedure has been used to allocate lands for new settlement. When numerous applicants have been declared eligible to participate, a name is drawn and the land awarded on this basis rather than using the procedure detailed above.

Public land is allocated for agricultural use in two broad categories: farmland dispositions on which both cultivation and grazing are permitted, and dispositions which restrict agricultural activities to livestock grazing. Table 34 provides additional information on the types of agricultural dispositions available on public land.

Both individual lessees and groups representing agricultural leaseholders of public land raised concerns related to security of tenure, lease transfer, lease improvements, sale of leased land, and the rights of leaseholders with regard to access by others (16, 19, 22, 38, 42, 62, 67, 215). Public land under agricultural disposition is an important component of the beef cattle industry in Alberta, and it was stated that 20 percent of Alberta's cattle production is derived from the use of these leased lands (16). Lessees maintain that long-range planning and investment are critical to the livestock industry and therefore security of tenure is important, particularly when lessees are investing capital (16, 67). It was also argued that uncertainty for lessees due to a reduction of lease time to less than 20 years has led to overuse of the land (42), and alternatively that tenure security would lead to better range management practices (16, 19, 215) and would remove much of the need for government assistance in range improvement since leaseholders would be more inclined to finance their own improvements (22). However it was also pointed out that lessees presently receive very favorable rental rates (75, 144, 210). Lessees of public land maintain that they must make their own improvements in addition to paying rent (16) and if the carrying capacity is increased by improvements beyond the allowable limit of 600 AUMs, some of the lease must be surrendered (62). Several presenters indicated that range improvements are needed (16, 19, 22, 38, 54, 194) but getting them approved by government agencies is sometimes difficult (22).

Given that many of the issues and conflicts concerning agricultural use of public land are related to the fact that these lands are publicly owned but privately managed, one solution might be for the government to sell some of these holdings. Although many presenters commented on some aspect of the sale of public lands (16, 18, 19, 22, 32, 38, 54, 62, 75, 104, 120, 131, 144, 158, 164, 181, 185, 205, 215, 235, 276), no one was prepared to simply allow public land to be sold to the highest bidder without at least some qualifications of sale. There was some strong opposition to privatizing public lands (75, 185, 205) especially in the White Area (181), but others were willing to consider sale of some lands under some conditions. These conditions ranged from requiring an environmental assessment prior to sale, including evaluation and protection of fish and wildlife resources (32, 144, 158, 164, 181), to giving present leaseholders the first option to purchase at a price

Table 34. Agricultural dispositions on public lands

Type of Disposition	Area	Activity	Maximum Term of Tenure	Leads to Title?	Taxes Paid by Disposition Holder?	Assignable?	Acres Under[1] Disposition	Number of Dispositions	Notes
Homestead Sales	Yellow	Cultivation Grazing	20 years	Yes	Yes, after 4 years when contract is issued on undeveloped land	Yes	314,706	992	Proposed changes to Public Lands Act will eliminate these
Farm Development Sales	White Yellow	Cultivation Grazing	25 years	Yes	Yes	Yes	241,137	971	
Farm Development Leases with option to purchase	White Yellow	Cultivation Grazing	5 years	Yes, with conditions	Yes	Yes	347,917	1,498	
Farm Development Leases without option to purchase	White Yellow	Cultivation Grazing	10 years	No	Yes	Yes			Usually issued on lands not available for title
Cultivation Permits	White Yellow	Cultivation Grazing	1 year	No	Yes	No	6,801	122	
Grazing Leases	White Yellow Green	Grazing	Usually	No	Yes	Yes	5,340,867	5,492	Includes leases to Grazing Associations
Grazing Permits	White Yellow	Grazing	1 year	No	Yes	Yes	280,001	872	
Hay Permits	White Yellow	Cutting of hay	June 1 – Oct 31	No	No	No	Permits issued for a specific amount of hay, not acreage	100 – 150	Issued quickly on localized basis
Head Tax Grazing Permits	White Yellow Green	Grazing	1 season	No	No	No	224,371 AUMs (462,955 acres) on grazing reserves 6,237 AUMs[2] (about 25,000 acres) elsewhere	1,537 on grazing reserves 20 others[2]	Authorize use of grazing reserves and unoccupied public land in Green Area outside forest reserves. Charges are per AUM
Forest Reserve Grazing Allotments	Green	Grazing	1 season	No	No	No		269[3]	No acreage figure available, but 74,378 AUMs were used
Forest Grazing Licences	Green (mainly FMAs)	Grazing	Usually 5 years	No	Only outside FMAs	No	63,098	75	

[1] Alberta Energy and Natural Resources 1984

[2] J. Laarhuis 1984 pers. comm.

[3] Alberta Energy and Natural Resources 1983a

related to the land's agricultural capability (18, 22, 38, 62, 120, 215). Most of the briefs advocating the latter conditions were from leaseholders who recognized the contribution of rented public lands to the viability of their operation, but were of the opinion that they could not compete with other groups who might bid on the land.

Provincial grazing reserves received comments during the hearings apart from other grazing activities. The grazing reserve program has been highly visible. It has given some small operators an opportunity for additional grazing, but it has also been an expensive program considering the relatively few livestock producers who have benefited. There were some comments which expressed concern about loss of wildlife habitat and loss of recreational opportunities due to clearing and development (194, 204), and one presenter pointed out that communicable diseases among cattle (such as pink-eye and VD) are more serious on grazing reserves (67). However, most of the comments pertained to the high capital and operating cost (much of it in the form of government assistance) required to establish and maintain grazing reserves (67, 68, 194, 204, 205), while only one brief (147) advocated expansion of the grazing reserve program.

The percentage of cattle grazed on grazing reserves has risen in the 10 years since the figures given in one report (Wood 1976), from 0.85 percent in 1974 to about 2.3 percent in 1984 (Miller 1984 pers. comm.), due largely to expansion in the grazing reserve program.

Recreational use of and access to public land under disposition was of concern to many hearing participants, whose comments often reflected divergent points of view (16, 19, 22, 32, 38, 75, 100, 124, 127, 143, 144, 151, 164, 176, 181, 185, 215). In the White Area especially, there is recreational pressure on public land near urban centers (for example, areas west and southwest of Calgary and south of Medicine Hat), and much of this land is also under agricultural disposition. Presently, under the Petty Trespass Act, holders of grazing leases and permits may not restrict access to their leases, and the Wildlife Act also exempts these lessees from the provisions which apply to owners or occupants. However, the current legal status and its interpretation are unclear. Some of these concerns relating to access and multiple use are considered in the next section of this report.

The briefs which addressed recreational use of public land under agricultural disposition were about evenly split on whether leaseholders' rights should include the right to restrict access, although few people distinguished between vehicle and foot access.

In general, leaseholders wanted the same rights that private landowners have with regard to restricting access (16, 19, 22, 38, 100, 215); that is, those wishing access must obtain permission from the lessee, who then could grant or deny access with the knowledge that trespassers would be liable for prosecution. This group also tended to hold the opinion that any policies governing access to agricultural lands must recognize the overriding priority of agriculture (16, 38).

Groups and individuals who disagreed with giving lessees the same rights as landowners generally agreed that those wanting access to leased land should attempt to contact the lessee; however, in most cases, this is a difficult and time-consuming task since the identity of the lessee is rarely obvious. Furthermore, although lessees may have cattle and other personal property on the land, this is public land to which the public has traditionally had a right of access. These positions were not totally inflexible though, as lessees generally maintained that seeking permission would not absolutely restrict access, and recreationists generally agreed that those seeking access must behave responsibly, and in some cases, control of access might be required. Briefs 16 (Alberta Cattle Commission) and 75 (Alberta Wilderness Association) were representative of the general positions of these two groups and made several suggestions as to how this issue could be handled.

3.2.2 Access and Multiple Use

Brief 75, presented by the Alberta Wilderness Association, outlined several areas of agreement between user groups on the access issue. Long before the ''Trespass Seminar'' held in early 1981, the Alberta Cattle Commission, the Western Stock Growers' Association, the Alberta Fish and Game Association, and other groups had been trying to resolve the question of public access to public lands held under grazing leases and permits. At that particular gathering, there was general agreement on the part of the groups represented that permission should be obtained for access to privately owned lands, and that there should be a simple way to contact the landowner for such permission.

Where the participants disagreed was over how the recognized multi-use aspect of public lands can best be ensured while protecting the investment of the lessee. Despite much effort by all interested parties, a satisfactory resolution to this disagreement had not been reached at the time of these hearings. Groups such as the Alberta Wilderness Association and the Fish and Game Association recognize the rights of public land leaseholders to the grass resource, and the need to protect the leaseholder from liability, property damage, and the time-consuming job of cleaning up after irresponsible people. At the same time, they fear that total control over access, if given to holders of public land leases, would essentially stop access to large areas of the province with great recreation value.

On the other side of the issue are the organizations representing those with grazing dispositions on public land. Their representations to these hearings expressed their desire to have full management control over the public land covered by their lease. These groups recognize that much of the public land under lease is among the most attractive in the province to other users — hikers, fishermen, and hunters (16). Those with such leases also recognize the potential value of these lands to the ever-growing population living in the cities and towns of the province. The Alberta Cattle Commission (16) recommended that total control of access be given to leaseholders of public lands, just as if they owned the land, and in addition that ''some means of compensating landowners be found for the game produced and harvested on their land'' so long as it is considered a public resource. They also recommended that a fee for access be permitted.

There are good arguments on both sides of the access question. Leaseholders need some assurance that the public land they use for grazing will not be abused by recreational users, and that compensation will be made for any damages to their investment, and that they will not be held responsible for accidents to people who are on the leased land. Recreational users of leased public lands need some assurance that these lands will continue to be available to them, but not without some responsibility on their part to the leaseholder.

The question of access to public lands goes beyond agricultural considerations into the area of outdoor recreation, the costs of maintaining recreational areas, and the rights, privileges, and responsibilities of all citizens with regard to public lands. In most cases, access to public lands under grazing dispositions is not a problem at all. Only in areas of high recreational value and areas near large population centers does the conflict become intense enough to require special measures.

Range Management Agreements, patterned after Forest Management Agreements, might be helpful in these situations. The Panel recommends "that Range Management Agreements should have a 20-year term renewable in the tenth year. Any increment of grazing capacity that was due to good management by the lessee, or range improvements carried out at the lessee's cost, should accrue to the lessee, even if this were to exceed the existing 600 animal unit limitation on size." In return for this long-term tenure, the rancher, like the timber company in the case of a Forest Management Agreement, would have to take certain actions. Among these would be the negotiation of and subsequent adherence to a range management plan. The range management plan could be developed as part of an Integrated Resource Plan, many of which are being prepared for areas subject to high multiple use pressure. As part of the range management plan, the lessee might, for example, be required to maintain specified areas for wildlife habitat or conservation purposes, designate certain trails for recreational use, or permit other activities such as snowmobiling on some part of the land between certain dates.

Ideally, the multiple use of public lands would be facilitated through Range Management Agreements (RMAs) in the same way it is through Forest Management Agreements. Just as timber companies acknowledge other users and are required to harvest their timber on public land without damaging the land base for other users, so lessees of public grazing lands, in return for security of tenure, would be required to recognize other users of the same land base, and manage the land accordingly. Furthermore, RMAs would have inherent flexibility and would in all likelihood be unique to each lessee, depending on the local circumstances. The present system of inspection as carried out by the Public Lands Division would be retained for the purposes of range management inspection; at the same time, the lease could be monitored to ensure that lessees are fulfilling their obligations concerning other users of the land base, and any impact which these activities might be having on the range could be assessed as well.

RMAs could also be used in situations where lessees want to make improvements to the lease. These improvements would be financed by the lessee and subject to the approval of the Department of Energy and Natural Resources, but a RMA would provide assurance to lessees that the lease tenure would be sufficiently long to recover the investment. The Panel does not view the adoption of RMAs as mandatory. In the vast majority of cases, existing leasehold arrangements are completely adequate. However, for those leaseholders whose leases are subject to high recreational demand and who are concerned about the continuity of their lease, an RMA could be useful.

Another approach to the expansion of agriculture on public land is provided by grazing reserves. The experience in providing for expansion of grazing land by developing grazing reserves indicates that the continued cost of operation and maintenance has not been met. The Panel recommends, therefore, that "grazing reserve expansion should be restricted to those cases where a grazing association indicates its willingness to undertake all costs of maintenance and operation. The responsibility for maintenance and operation of existing reserves should be turned over to local grazing associations as quickly as possible."

Grazing reserves have not only received government assistance for the capital cost of clearing and development but have been supported for a large portion of maintenance and operating costs. If grazing fees cannot cover the costs of maintenance and operation, it indicates that the method of operation is not realistic or practical and should be abandoned.

Future investments in the development of grazing land should be restricted to those parcels where it can be shown that grazing fees and charges would be sufficient to meet all maintenance and operating costs, and where a grazing association indicates its willingness to assume all management responsibilities for the area following development.

The Panel believes that the expansion of markets for beef, the reduction of costs through research on increasing grass and forage yields, and the utilization of sensitive lands within existing farming areas for grass and forage would be more effective supports to the ranching industry and the agricultural land base than the expansion of grazing reserves on the present basis.

3.2.3 Energy Dispositions

For the most part, energy activities on public land only affect agriculture when they occur on land already under an agricultural disposition. Even then, although there may be some impact, not all agriculture disposition holders are entitled to compensation. Holders of grazing leases and permits as well as those whose dispositions lead to title can seek compensation which is both negotiable and transferable. For purposes of negotiating compensation, these persons are considered to be in the same position as landowners; the procedures are essentially the same as for private landowners, except of course the lessees do not own the land.

Public land disposition holders negotiate directly with mineral operators concerning the acquisition and terms of compensation for the land surface area required for well sites and roadways, as described in Section 3.1.4.

> *On public lands under disposition not leading to title, the Public Lands Division requires the mineral operator to provide a copy of the consent agreement negotiated between the mineral operator and the occupant (prior lessee, licensee, permittee) before issuing a disposition to the mineral operator....On public lands under agreement for sale, mineral operators must provide the Public Lands Division with a copy of a 'private surface agreement' negotiated with the disposition holder. The Public Lands Division will then provide consent to the agreement but may, if the sale account of the disposition holder is in arrears, direct that a specified portion of the compensation or rental be paid to the Department in order to bring the account into good standing.* (Alberta Energy and Natural Resources 1981:29)

In any case, when a private surface agreement cannot be negotiated, the mineral operator has recourse to the Surface Rights Board (Section 3.1.4).

During the public hearings, few comments pertained directly to the matter of compensation for lessees of public land; the opinion was expressed that compensation for oil and gas activities should not be paid to lessees (164). Although reclamation following resource extraction was a matter of concern for a number of hearing participants, most of these comments did not refer specifically to public lands. Indeed, the effects of resource extraction seem less on public lands used for agriculture than on private land.

3.2.4 Forestry Dispositions

Forestry dispositions as a whole have little impact on existing agricultural operations, since the only overlap occurs in a small portion of the Green Area. In some cases, grazing and forestry are compatible uses of the same land base.

The question of northern expansion of agriculture is of potential concern to both forestry and agricultural interests, since the forest industry would certainly be affected if agriculture were to undergo major expansion in northern Alberta. Large portions of northern Alberta are forested and have been allocated through Forest Management Agreements and other contracts to various logging companies. Although this land is suitable for producing trees, much of it is marginal for cultivation; furthermore, the forest industry is a major source of off-farm income for many people farming in the north. A number of briefs presented during the public hearings considered the contribution of forestry to Alberta's economy and/or the impacts which agricultural expansion, especially in the north, would have on the forest industry (3, 6, 14, 130, 137, 139, 140, 147, 154, 163, 212, 226, 227). However, because these details relate more directly to the question of northern expansion of agriculture than to the general use of public land, they are considered in Section 4 on northern expansion.

3.2.5 Integrated Resource Plans

As discussed earlier, more than half of the land base of Alberta is publicly owned. In some areas there have been conflicting demands over the use of these lands, and as a result of the preparation and publication in 1977 of the *Policy for Resource Management of the Eastern Slopes*, integrated management planning conducted under a comprehensive interagency approach was identified as the key to effective management of the resources of that region. Subsequently, the system and program for integrated planning of all public lands and resources in Alberta were founded on the philosophy presented in that publication. However,

> *...the single most important consequence of integrated resource management is that it makes it possible for the government to fulfill its role as manager of the province's natural resources and public lands.* (Alberta Energy and Natural Resources 1983b:5)

Integrated resource planning on public land occurs at provincial, regional, subregional, and local levels, and is co-ordinated by the Resource Evaluation and Planning (REAP) Division of the Department of Energy and Natural Resources. A number of interested parties have input to the development of Integrated Resource Plans (IRPs), including provincial, local, and sometimes federal government agencies, as well as non-government groups. IRPs have been and are being prepared for a wide range of public land throughout Alberta (see Figure 3), on a priority basis. The composition of a plan and the level of detail therein are related to the land use pressures in the particular area being examined. IRPs help to assess the potential of an area for various land use activities and have been instrumental in

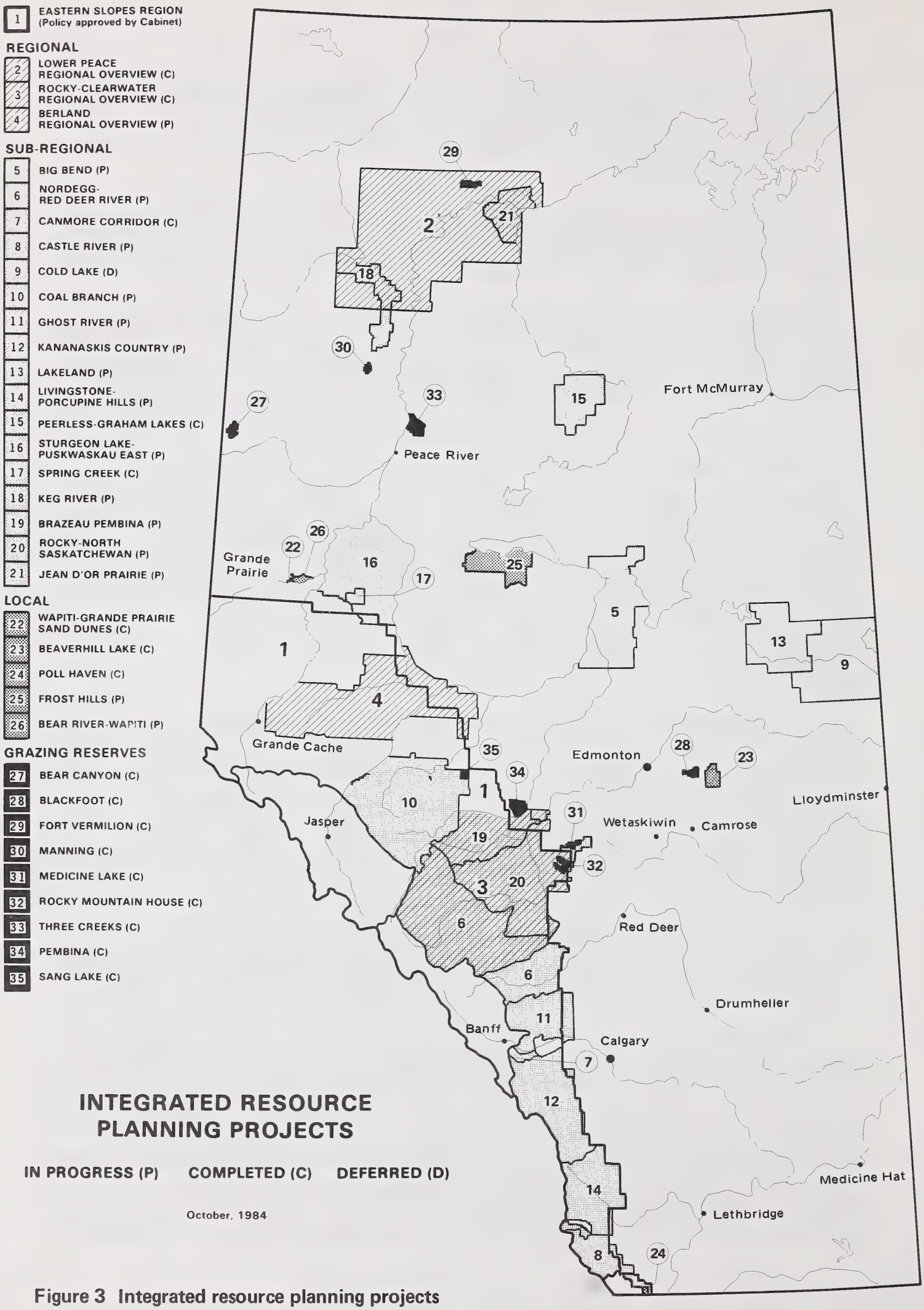


Figure 3 Integrated resource planning projects

Source: Alberta Energy and Natural Resources identifying areas, particularly in the north, which may be suitable for agriculture. Further information on the initiation, preparation, and approval of Integrated Resource Plans can be obtained from a document entitled *A System for Integrated Resource Planning in Alberta: Discussion Paper*, published by Alberta Energy and Natural Resources (1983b).

The integrated planning process as carried out by REAP applies only to public lands, with the Alberta Planning Board and regional planning commissions having responsibilities for private land. With the exception of Beaverhill Lake and some grazing reserves, there have been no IRPs completed in the White Area to date. Most of the plans in progress are for portions of the Green Area (including the Eastern Slopes), and the only agricultural activities that might be affected by these plans are operations which have grazing dispositions in or adjacent to the planning areas.

There were some comments on various aspects of integrated management and the planning process during the hearings (8, 14, 32, 33, 75, 130, 137, 139, 163, 181, 212, 276); people seemed generally to favor this approach, although there were some comments that the process was slow (139, 212) and that not all agencies involved were equally committed to the concept (8, 137). There was particular concern expressed that IRPs should identify uses to which the land should *not* be put as well as uses which should be permitted. Integrated Resource Plans are one way of identifying and protecting wetlands, wilderness, and other environmentally sensitive areas (32, 33); they can also provide information as to which land is most suitable for activities such as agriculture or forestry.

3.3 Factors Affecting Production and Conservation

The primary production level of the agricultural industry operates in at least three markets; these are a commodity market, an input market (which is primarily financial), and a land market (Wallace 1983). As well, farm families often participate in a labor market, with off-farm income making a substantial contribution to the viability of many modern farm businesses (Anderson 1984). Activities in all of these areas affect the on-farm decisions which then influence production and conservation.

The maintenance of the agricultural land base is a necessary component in commodity production. Both the quality and quantity of the land base are important, but also important is the market value of this land. Between 1961 and 1979, the value of farmland in Alberta showed more than a ten-fold increase, reaching an average price of $386 per acre in 1980 (Kelly and Moreau 1982). A steadily increasing share of the capital value of farms has been represented by land and buildings, so that by 1982, land and buildings represented 80.9 percent of all farm capital in Alberta. The inflated value of the land market has a spillover effect on the input market since not only is the amount of farm capital requiring financing pushed up by increasing land values, but the cost of financing has also been increasing.

Other input costs have also risen, and often many of these costs are met through off-farm income. Participants in the public hearings indicated that in fact many farming operations, particularly those just starting up, could not survive without the benefit of jobs in other parts of the economy (3, 5, 7, 9, 97, 101, 119, 139, 166, 266). However, this can create a dilemma for the farming community — the higher salaries found in urban and industrial sectors draw labor away from the farms, yet those same salaries provide the means to help meet the high operating costs of farming. Data from the 1981 census indicate that total family income for the average Alberta census farm operator was $27,905, of which 66 percent or $18,440 was derived from off-farm employment. (A census farm, in the 1981 census of agriculture, was defined as a farm, ranch, or other agricultural holding with sales of agricultural products during the past 12 months of $250 or more.) This dependence on off-farm employment can be found throughout Alberta, though participation in off-farm employment appears to increase from the south to the north of the province (Anderson 1984). However, the same study revealed that for the province as a whole 41 percent of all farmers reported some off-farm income, but for low-income farmers (that is, those with annual farm sales of between $2,500 and $25,000), this figure rose to 55 percent. Another point made in this study was that of the approximately 58,000 census farms in Alberta, just over 28,000 reported annual farm sales in excess of $25,000, and that about 49 percent of the farms in this province are generating 91 percent of total commercial agricultural output.

None of the factors influencing primary production operate in isolation from the others. Furthermore, the institutional arrangements of government that are superimposed upon these factors also affect the farmer's decision-making process. All of these elements influence production patterns, patterns which are ultimately related to farmers' decisions concerning the types and amounts of crops to plant, the number of animals to overwinter, and so on.

Some of these factors, such as export market conditions, climatic conditions, and interest rates, are beyond the farmer's control. Farmers generally must make these important decisions without knowing exactly what role external factors will play. The safety net under many present-day farmers has been strengthened through supply-management systems, the availability of crop insurance, and the Canadian Wheat Board, though the farmer remains very exposed to the vagaries of the various markets in which he must deal. The factors over which the farmer does have control are the cultural and management practices, which affect both production and productivity.

The two terms ''production'' and ''productivity'', which are sometimes used interchangeably, do not mean the same thing. ''Production'' refers to the amount which is actually produced, measured in bushels, tons, kilograms, or some other unit of output. ''Productivity'' is here considered to be a measure of efficiency — the amount of input required per unit of output. A farmer could increase production without increasing productivity by expanding the cultivated acreage, or by increasing other inputs. A farmer can increase productivity, or efficiency, in many ways: by reducing input costs while maintaining production levels, or holding input costs constant while increasing production. Increased productivity implies more output per unit of input.

Clearly market and other economic forces have increased the pressure on farmers to extract the most from their land in the short term. These demands have been met through a combination of agricultural practices, some of which have a detrimental impact on soil quality in the long term. That these are issues of importance is reflected in the comments made during the public hearings; approximately 25 percent of those making presentations to the Panel addressed the matter of soil quality and land conservation. There was general agreement that prime farmland is limited in Alberta and that the better land should be preserved for agriculture, with industrial and urban growth as well as country residential development being directed to lower quality land. Many people felt that fewer and less costly inputs are required to productively farm better soils, so it is more rational to keep this land for agriculture rather than allowing it to be developed while trying to produce replacement crops on poorer, often marginal, land (30, 59, 74, 96, 133, 136, 156, 167, 178, 183, 189, 190, 191, 196, 197, 211, 243, 245, 249, 256, 259, 261, 263, 271). However, it was also suggested that the market should decide land use, since regulatory systems cannot keep up with societal changes (52) and that more land use controls and regulations are not needed (52, 270).

There was, however, some disagreement about the exact criteria for "good" or "better" agricultural land, and it was pointed out that the approach of protecting designated soil classes is inappropriate in some regions because other factors are involved in addition to soil quality, such as location and surrounding land uses (111). Others commented that in determining land use and land use policy, it is necessary to consider the inherent capability of land to produce (which is affected by factors such as soil quality and climate) as well as the location of the land in relation to other activities, and the relative importance of the use (25, 30). Furthermore, in some areas, land with a Canada Land Inventory (CLI) rating of 4 or 5 may be the best land there is (54, 56, 81, 192, 194, 202). Also, livestock producers, particularly ranchers, whose operations can profitably use land with a lower CLI rating, could have their land base reduced if housing and industrial expansion were restricted to areas with those lower soil classes (18, 19, 39, 55, 101, 104, 111, 192, 224). It was emphasized that existing policies to protect prime agricultural lands are usually only guidelines (224), and although local differences in soil quality and capability should be considered in the planning process (24, 70, 238), there is in fact a great deal of inconsistency among the decisions of various planning agencies in Alberta concerning the protection of agricultural land (223).

The opinion was expressed by several presenters that the CLI classification system is now being used for purposes for which it was never intended nor designed (38, 272); for example, in the case of agriculture, the highest rated lands in this system are those with the greatest capability for grain production, and for this type of extensive land use, the system is useful. However, it was never meant to be used on a detailed scale for land use planning and this, among other things, makes it inadequate and inappropriate as a planning tool (12, 18, 21, 72, 80, 84, 111, 182, 192, 201, 215, 224, 272).

A number of presenters indicated that the CLI classification for agriculture should be refined to be more precise, providing greater detail, and/or taking into account more factors (12, 32, 35, 38, 72, 80, 111, 152, 224). It was also suggested that revisions to the CLI could be part of a larger, more comprehensive soil mapping and inventory survey which ought to be carried out by the Province (111, 146, 152, 196, 224, 237, 241).

Concern was expressed by various presenters about the apparent decline in soil quality on the Prairies. Loss of organic matter, salinity, erosion, and increased acidification were all mentioned as direct evidence of soil degradation; the fact that many farmers are having to use more inputs such as fertilizers and lime to simply maintain present levels of production also indicates that inherent soil fertility is declining. Several hearing participants commented that in some areas, loss of agricultural land due to soil degradation is greater than losses due to any other cause, including urban growth and country residential development (57, 129, 208, 241, 256). Many of these problems have resulted from inappropriate management over a long period of time and from a lack of knowledge or information about the causes of soil degradation. It was recognized that poor soil management and conservation practices have contributed to a decline in soil quality (21, 30, 40, 57, 70, 104, 129, 177, 178, 179, 214, 218, 224, 261); however, it was also pointed out that good conservation and management are long-term endeavors, and for many farmers economic conditions dictate the necessity of increasing production in the short term even at the expense of depleting soil resources (30, 40, 129, 179, 245, 253). If soil is to be considered a renewable resource that in the long term benefits society as a whole as well as individual farmers and their children, then proper soil management and conservation techniques must be encouraged and implemented (40, 73, 104, 133, 210, 214, 218, 220, 224, 243, 245).

Wind and water erosion contribute substantially to declining soil fertility by removing valuable topsoil and organic matter. Many factors contribute to erosion, such as excessive tillage (which is often related to the practice of summerfallowing) and clearing and breaking land which is naturally prone to erosion (2, 93, 94, 104, 139, 148, 192, 197, 221, 229, 248, 267). Although methods to prevent and control erosion are known, the erosion process can be so insidious, or the evidence of damage so easily tilled away, that by the time remedial steps are taken they can be very costly and difficult to implement (167, 220, 248). Preventive methods such as strip farming in areas most vulnerable to erosion have become less popular with increases in the size of farm machinery, and some of the lessons of the "Dirty '30s" are being forgotten (30, 57, 178, 192, 197). In many cases increased inputs of fertilizers and other chemicals have masked the loss of inherent soil fertility by replacing eroded nutrients with synthetic ones, thus allowing farmers to maintain production without any appreciation of the losses due to erosion (220).

It is often difficult to pinpoint one single cause for many soil degradation problems, including erosion. Summerfallow, however, has been implicated in many of these problems. It is a good example of an agricultural practice which has been influenced by economic as well as political and institutional factors. Summerfallow was incorporated into the crop rotation system on the Prairies early in this century as a means of controlling weeds, conserving moisture, and enhancing nitrogen availability. Since the inception of Wheat Board quotas, summerfallowing has also enabled farmers to stabilize their income from year to year, and in fact the quotas provide an incentive to continue this practice. Factors affecting the decision to summerfallow are discussed in a background document prepared prior to the public hearings (Anderson 1981). Although in some locations and in some circumstances summerfallowing may be necessary to control weeds and conserve moisture, it is now generally considered to be largely responsible for some serious soil problems which have become evident in the last decade; among these are increased soil erosion, increased dryland salinity, and declining organic matter content. In effect, declining soil fertility is often a consequence of long-continued summerfallow, and until this cause is removed, the cycle will not be broken.

The repeated tillage associated with summerfallow accelerates the release of soil nitrogen from the breakdown of organic matter, and thus benefits the immediate growth of plants, and helps to control weeds. However, at the same time,

> *...it jeopardizes stability of the whole soil system such that long term productivity could diminish to zero in extreme cases. Balancing these two opposing outcomes from tillage is the aim of much present research and some innovative farm practices* (McGill 1982:44).

Many participants at the public hearings commented specifically on various aspects of the use of summerfallow. It was noted that the repeated tillage associated with summerfallow leaves fields bare and susceptible to both wind and water erosion (93, 94, 224); summerfallowing in most cases is not an efficient way to conserve moisture (45, 47, 248, 261); it reduces soil organic matter (40, 224, 250) and has been linked with increases in dryland salinity. Several people at the public hearings were of the opinion that summerfallow acreage could and should be reduced (218, 224, 225, 248, 250, 261). Zero or minimum tillage was suggested as an alternative to summerfallowing, but even the proponents agreed that this is still considered an innovative approach and has not been widely adopted in Alberta due in large part to the high cost of equipment, the expense associated with increased reliance on chemical weed control, and the management skills which must be acquired (47, 56, 64, 72). Although summerfallowing contributes to declining soil quality, the issue involves more than a simple change in management practices. In some situations summerfallow may be necessary to control weeds (91) or in very dry areas to conserve valuable moisture (250), but as other presenters pointed out, farmers must consider the economic implications too. Although continuous cropping avoids the large capital outlay required for zero till equipment, many farmers find it hard to justify an increase in production given the existing quota system, insecure markets, past transportation and grain-handling difficulties, and their already substantial time investment in farming (109, 175, 224).

The issue of summerfallow also underlies growing concerns about soil salinization (39, 45, 47, 56, 67, 94, 104, 178, 228, 241). Earlier in this century, fallowed fields were generally not tilled as often nor as effectively, so that many weeds were left to use up water supplies. Although the result was poorer weed control, the water table was kept down and saline seeps were less common. Saline seeps can develop slowly and, as with erosion, farmers may be reluctant to deal with the problem until it becomes too severe to neglect. In the case of soil salinity, reclamation may involve taking the recharge area out of the usual crop rotation and growing a deep-rooted crop such as alfalfa to lower the water table (45, 236). The installation of drainage systems is a more expensive method of prevention and reclamation, but is effective on selected sites (45, 219). Because the recharge and discharge areas are often not on land owned by the same person, one farmer's agricultural practices can have serious detrimental effects on a neighbor's land. However, people who addressed this matter agreed that peer pressure and education were more effective than legislation to obtain co-operation between landowners (45, 104, 178, 218).

Salinity problems on irrigated land generally result from a leaky distribution system or from over-irrigation (63, 64, 214, 219). However, many of these problems are being corrected by canal rehabilitation, drainage, and judicious application of water via sprinkler systems (41, 43, 219). Presenters stated that more work is needed in various areas of soil salinity research (39, 65, 104, 178) with particular emphasis on finding and dealing with recharge areas in dryland farming areas (45, 64).

Hearing participants in northern Alberta commented that soils in those areas tended to be naturally acidic, and they were concerned about any further inputs of acidic material whether from fertilizers or from industrial emissions (104, 155, 159, 225). Some presenters expressed concern about the levels of acid-forming emissions in Alberta (particularly sulphur dioxide) and the effects which they were having on soils and property (94, 108, 155, 159, 171). Others were of the opinion that Alberta soils are for the most part well buffered and unlikely to be damaged by acid deposition, except possibly in the immediate vicinity of some sulphur sources (211, 244) and there were comments that some soils are in fact sulphur-deficient and that added sulphates could be a benefit (108, 134). The use of chemical fertilizers was considered to be a major cause of soil acidification by some (133, 157, 195, 225, 244, 246, 274), and one study was cited to show that manure does not have the same acidifying effect as commercial fertilizer although it also supplies nitrogen (246). Liming was considered to be an acceptable method of ameliorating acidic conditions, but the amount to use, the timing of application, and the cost are all factors to be weighed (40, 104, 225, 246, 257). One person commented that chemicals are needed to maximize agricultural production, and that increased use of lime must be considered along with increased fertilizer use (250). The provincial government's lime assistance program was considered appropriate and adequate (40, 104, 147).

Issues pertaining to the use of agricultural chemicals received comment by many presenters with a variety of interests and concerns. Perhaps more than other issues pertaining to soil management and conservation, the use and misuse of chemicals to control weeds and insect pests has received widespread media attention in recent years. Much of this coverage has resulted from the use of chemicals for purposes other than food production (such as in the forest industry); nevertheless some of the same chemicals are used in agriculture, albeit with different regulations and requirements concerning use and application. Despite these differences, many people have become increasingly concerned not only about the chemicals used to produce their food, but about the effects these chemicals may have on the environment in the long term.

A number of people expressed concern about and, in some cases, opposition to the widespread and apparently increasing use of chemicals that seems to be occurring (20, 34, 40, 59, 70, 92, 98, 126, 129, 158, 161, 178, 205, 222, 244, 267, 269). Some, such as the presenters of briefs 20, 34, 92, and 267, expressed concern about the effects of chemicals on non-target organisms in the food chain and about the possible reduction in diversity of species that might result from continued use of chemicals. Others, some of whom were farmers, were concerned about the industrial use of chemicals to control weeds and brush along roadsides, powerlines, and oil and gas sites (92, 98, 106, 121, 205, 267); one presenter was a beekeeper whose bees relied on roadside wildflowers which were often removed by spraying (98), while another commented on damage to shelterbelts from careless spraying (121). The need for on-farm weed control was recognized, as weeds compete with crops for nutrients, space, and water, and use of herbicides enables farmers to maintain their production (262); some people felt that this position was not appreciated by non-farmers, and that farmers in fact are careful with their use of chemicals (30, 180). Nevertheless, some believed that reliance on agricultural chemicals should be decreased, and other methods of weed and pest control should be adopted (20, 34, 126, 129, 269). Other comments included concerns about contamination of heavy metals and other toxic trace elements in commercial fertilizers

(133, 246), additional problems associated with fertilizer use such as water pollution (70, 133, 161, 262), and the continued need for control of blackflies in northern Alberta (122).

It was stated that perhaps farmers rely too heavily on chemicals (156) and many people thought that more research was needed, not only to develop alternatives to chemical pesticides but to determine how to best use existing chemicals without causing any long-term environmental damage; also, an ongoing research program is required to monitor environmental parameters, to assess the impacts of current chemical use, and possibly to develop alternatives to chemicals now being used (34, 70, 85, 126, 129, 133, 178, 180, 244, 262, 276).

The general tone seemed to be that, in the long run, good conservation and environmentally sound agricultural practices would pay off for farmers in improved soil quality and fewer serious soil problems like salinity, erosion, and acidification. Many presenters discussed the ethics of modern agriculture, indicating that farmers and society as a whole had a responsibility to ensure that our land was well managed and passed on to future generations in a productive state (11, 21, 23, 25, 29, 64, 70, 72, 78, 80, 91, 92, 95, 118, 129, 133, 149, 161, 172, 179, 184, 186, 195, 199, 200, 210, 215, 216, 218, 221, 224, 245, 252, 255, 259, 260, 261, 267, 272). Farmers were seen as stewards of the land, entrusted with its management and conservation, and it was a common feeling that land must not be regarded as a commodity to be exploited or bought and sold, but as a productive renewable resource. There was a comment that the burden fell entirely on the landowner in this regard and that this was unfair (30); others pointed out that along with landowners' rights there are also landowners' responsibilities (152, 214, 224, 245, 260). Several participants identified that through our various levels of government, society could and should assist farmers in their responsibilities to practise good conservation (25, 118, 126, 195, 200, 224, 245).

To address the concerns about the effects of industrial emissions and chemical or product spills on agricultural land, the Panel recommends "that a research fund be established to study soil reclamation and effects of industry on agriculture. This fund could be developed by contributions from industry, matched by government." This recommendation is discussed further in Section 5.4.1, Areas for Research.

While testing of agricultural chemicals is quite extensive before a product can be licensed, there is concern about the long-term effects of some products which are persistent, and the Panel recommends that "research should be carried out on an ongoing basis to study the long-term effects of agricultural chemicals on soils." This recommendation is also discussed further in Section 5.4.1.

3.3.1 Erosion

Although soil degradation due to erosion can be obvious in extreme cases, it is often a gradual process, and as a result, is very difficult to quantify. Some soils, by virtue of their physical characteristics, are inherently susceptible to erosion; when these soils occur in areas with climatic conditions that lead to erosion (such as high winds or intense rainfall), serious topsoil losses can occur. Other factors such as the topography of the land, the absence of vegetation including both cover crops and shelterbelts, and excessive tillage all contribute to increased erosion. The shift away from mixed farming and livestock operations to production of grain and oilseeds has led to a reduction in forage production and also in some cases to breaking land which might be better left untouched. The summerfallow associated with grain and oilseed production also increases the risk of erosion.

Erosion is in fact a process; the result of this process is a loss in soil fertility due to removal of organic matter and nutrients contained in the eroded topsoil. There is presently no system in place for documenting the extent of soil erosion on the Prairies, so it is difficult to estimate the losses that could be occurring. Alberta Agriculture estimated that, on average, with the removal of only one inch of topsoil in areas of Dark Brown soils, there is a per-acre loss of 142 tons of material, including 4.3 tons of organic matter, 529 pounds of nitrogen, and 154 pounds of phosphorus (Alberta Agriculture 1980). The amount of land affected by wind erosion alone in Alberta has been estimated to be approaching 400,000 hectares (one million acres) per year (McGill 1982).

The total cost of erosion to farmers includes (a) the cost of increased inputs to offset soil losses; (b) a potential yield loss of approximately 15 percent which will not be recovered by extra inputs; (c) increased power requirements; (d) damage to growing crops; and (e) the removal of land from production as a result of the erosion. Depending on the soil type, climate, and the type of erosion taking place, a rough estimate of yield reduction per inch of topsoil loss is about 2.5 bushels per acre for grains such as wheat and oats (National Soil Erosion – Soil Productivity Research Planning Committee 1981).

Because the rate of topsoil formation is so much slower than topsoil losses due to erosion, these losses are basically cumulative. One long-term study at Lethbridge indicated that even with added fertilizer, a soil plot which had had 20 centimeters (eight inches) of topsoil removed gave a net return of $40 per hectare ($16.20 per acre) less than the non-eroded counterpart (Lindwall 1980). The Prairie Farm Rehabilitation Administration (PFRA) estimates that on the Prairies there is an average yearly reduction in yield of 71,600 tonnes (78,900 tons) of wheat due to erosion (PFRA 1983). Since the Prairies have been farmed for an average of 65 years, the loss in potential production on the Prairies due to erosion over this time period amounts to about 4.7 million tonnes (5.2 million tons) in terms of wheat; this is 13.7 percent of the total annual crop production averaged between 1969 and 1978. Best estimates show incremental losses during this century of $6 million annually due to continuing erosion. This accumulated loss of soil fertility now costs Prairie farmers a total of $370 million per year, based on losses of available plant nutrients and on non-recoverable wheat production. Of this 4.7 million tonnes (5.2 million tons) of lost potential productivity, about 1.4 million tonnes (1.5 million tons) can be attributed to Alberta, with an associated dollar loss to the Alberta farm economy of nearly $120 million. With a further estimated 277 million tonnes (305 million tons) of topsoil being lost annually across the Prairies, it is estimated that by the year 2000, erosion will cost Prairie farmers $472 million annually, and the cumulative cost from now until the year 2000 is estimated at $8 billion (PFRA 1984). Studies have indicated that soil losses from erosion can be reduced by as much as 50 percent through the use of proper soil conservation techniques; if the benefit of erosion control is assumed to be the value of production that would otherwise be lost, then the annual benefit of erosion control would amount to about $3 million (PFRA 1983).

3.3.2 Organic Matter and Nutrient Loss

Organic matter contributes a great deal to the inherent fertility of soil. It is a source of many plant nutrients such as nitrogen, phosphorus, sulphur, and a number of required micronutrients. It also plays an important role in improving soil tilth and maintaining soil stability. Since the Prairies were broken for tilled agriculture early in this century, there has been a steady depletion in organic matter reserves as mineral nutrients are released for crop growth.

Concern has focused not only on the fact that organic matter loss is occurring but on the rate at which this is taking place. Summerfallow and intensive tillage are implicated in this area of soil degradation too. As organic matter decomposes, nitrogen in the soil is converted from a form unavailable to plants to a form which plants can use, and in the process organic matter content is decreased. It is possible to manage the organic matter content of soil, and re-establish a balance between input and loss. When land is fallowed and intensively cultivated, the decomposition process is speeded up; on the other hand, organic matter can be increased through continuous cropping, increased production, retention of plant residues, or adding previously removed plant residues in forms such as manure.

Prairie soils have lost a minimum of 35 to 50 percent of their original organic matter, with the greatest losses in the Black soil zone (McGill et al. 1981). Nitrogen is considered to be the nutrient most susceptible to losses resulting from farming practices and these losses are at least 15 percent higher on fallowed land than on cropped land (PFRA 1983). It is estimated that by 1990 the contribution of soil nitrogen will be only a small portion of the harvested nitrogen content of cereals, so that major increases in fertilizer nitrogen inputs will be required to increase yields (McGill et al. 1981).

It is known that erosion and organic matter loss are linked through a positive feedback system; erosion selectively removes organic-rich materials, and the loss of those materials increases susceptibility to further erosion (McGill et al. 1981). Thus, a number of soil conservation objectives could be accomplished by reducing or eliminating the practice of summerfallowing. This would increase organic matter, reduce susceptibility to erosion, and could contribute to halting the spread of soil salinity in some areas.

3.3.3 Dryland Salinity

Dryland salinity is related to patterns of groundwater movement and to the chemistry of the soil and bedrock formations through which this water flows. Groundwater dissolves salts from the soil, and where the water table is within one meter of the surface, saline water can move upward and evaporate, leaving the salts behind. These areas of salt-covered soil are referred to as discharge areas or seeps, while the areas where excess water originates are known as recharge areas.

Maximum water use by many cultivated crops does not coincide with peak water availability; thus excess water percolates downward to the water table, increasing the groundwater supply and leading to increased discharge downslope. Summerfallow has contributed to the spread of dryland salinity since, during the fallow year, plant growth is eliminated and water which falls in excess of soil capacity passes into subsoil depths. Any practice which reduces or eliminates the vegetative cover, including overgrazing or deforestation, can contribute to dryland salinity. These factors as well as control measures are discussed in detail in a background document prepared prior to the public hearings (Lilley 1982).

Saline seeps can be controlled by reducing groundwater recharge or by preventing the accumulation of excess water in the discharge area. Structural remedies include the installation of surface or subsurface drainage systems, but these are often costly. Vegetation can also be used to reduce recharge or control discharge, as plants remove water from the soil and over the long term succeed in lowering the water table. Continuous cereal cropping or growing deep-rooted crops such as alfalfa are important methods of control.

Early detection of seep areas is critical to implementing measures to prevent their spread and further degradation of productive crop land. Potential problem areas can often be identified visually, as excessive and prolonged surface wetness indicates a high water table. Immature plants in an otherwise mature crop indicate continued plant growth because extra moisture is still available. The appearance of some plants which are known to have high salt tolerances may also indicate a potential seep problem.

In southern Alberta, the Dryland Salinity Control Association (45, 236) has been working successfully with several federal and provincial government departments to deal with soil salinity problems. One of their major thrusts has been to locate recharge areas through co-ordinated drilling programs to determine groundwater flow patterns. When these are known, appropriate control measures can be implemented. In many cases, seep development can be controlled through proper vegetation management, which tends to be considerably less costly than subsurface drainage systems. Surface drainage of intermittent ponds in the recharge area can be accomplished by constructing shallow trenches; and this is often an effective control measure in appropriate circumstances.

The amount of land affected by salinity is difficult to determine accurately. Vander Pluym et al. (1981) suggest that the area affected in Alberta is approximately 200,000 hectares (500,000 acres) or one percent of the land in agriculture, with the most severe problems in the Vulcan-Warner area of southern Alberta; the area affected by salinity is estimated to be increasing at about 10 percent per year. Other information released by the Lethbridge Research Station suggests that as many as 700,000 hectares (1.7 million acres) in southern Alberta may be affected by agriculture-induced salinity. This estimate was obtained by mapping soil salinity from data obtained by satellite (Sommerfeldt 1984).

The economic impact of reduced productivity due to salinization is significant. The Prairie Farm Rehabilitation Administration calculated that farmers in the Prairie provinces are currently losing about $25.8 million annually due solely to the spread of salinity (PFRA 1984). As with erosion, the loss is cumulative, and when the cumulative total amount of land out of production due to salinity is considered, the losses are ten times this amount, or $258 million. In Alberta, the annual cost to farmers of the estimated 10 percent increase per year is calculated to be $2.36 million. Furthermore, the real estate value of land affected by seepage is reduced, adding to the losses which farmers could expect to suffer as a result of salinity.

Recharge and discharge areas are often not owned by the same person. Therefore, salinity on one parcel may be the result of agricultural practices on another parcel, and the landowner who is experiencing the problem presently has little recourse to prevent it. The producer causing the problem has no incentive to prevent or control it, and may in fact be unaware of the matter. Changing attitudes and applying peer pressure may be the only way to get co-operation and make progress in arresting the spread of dryland salinity (45). Removing senior government incentives for summerfallowing would help to reduce the practice, and developing markets for forage crops which can be used in reclamation of seeps would also provide incentive for farmers to adjust their land use practices. The Panel has developed recommendations to this effect later in this section (see also Section 2.6).

3.3.4 Agricultural Chemicals

Grasshoppers, flea beetles, and bertha armyworms are probably the most common pests afflicting crops in this province. Pest outbreaks and subsequent crop damage are influenced by climatic conditions as well as other factors; for example, a potential grasshopper outbreak was predicted in various parts of Alberta for several years, but prior to 1984 spring weather conditions were unfavorable at the time of hatching, and the infestations did not materialize in most cases. Chemicals commonly used to control pests today are considerably less persistent than those used 20 years ago. Nevertheless, there are many gaps in our knowledge of how such pesticides affect non-target organisms both in the soil and in other parts of the environment, as well as how these chemicals interact with each other.

Herbicides to control weeds are commonly used on the Prairies, with four chemicals (2,4-D, MCPA, triallate, and trifluralin) accounting for about 80 percent of the herbicides used (Smith et al. 1981). As with insecticides, there are gaps in our knowledge of the chemistry and behavior of weed control chemicals. Herbicides vary in their persistence, and this is an important feature depending on the sort of weed control desired. Some wild oat herbicides, for example, are applied in the fall and persist over winter to kill weeds which germinate in the spring. Other herbicides are even more persistent, such as some which are used for brush control; in these cases it is imperative that there be no contamination of agricultural land because crop growth could be inhibited for several years. Another factor which must be considered in the use of herbicides is the planned crop rotation, since traces of chemicals may persist in sufficient amounts to affect subsequent crops. It is not uncommon for different herbicides to be applied to a field in successive seasons, and the interactions which follow have rarely been studied. There may be no adverse effects, but work is needed to assess the possibility of residue build-up over a longer term and to predict what synergistic effects might occur, as suggested in the recommendation concerning assessment of the long-term effect of agricultural chemicals on soil described in detail in Section 5.4.1.

One of the factors which affects herbicide persistence is climate. Herbicides are lost from the soil through biological degradation and volatilization, processes which are favored by mild and moist conditions. Such conditions tend to be found on the Prairies only in the spring, and generally the behavior of chemicals under Prairie conditions is not well known.

As with pesticides, there is some concern about the effects of herbicides on soil microflora which are involved in decomposition processes. To maintain soil fertility, it is necessary for all elements of the soil ecosystem to be in equilibrium, and the inter-relationship of these elements needs closer scrutiny. Such studies are made more difficult because of the many variables in a normal healthy ecosystem, and it can be hard to identify all these variables, let alone control them. Research would provide at least some baseline data for chemical use in Alberta, but on-farm conditions would vary with a farmer's management practices and with the inherent characteristics of the soil. Studies in Saskatchewan on repeated applications of 2,4-D and MCPA suggest that there have been no apparent effects on crop rotations after 35 years (Smith et al. 1981); nevertheless, monitoring the effects of herbicide use on crop yields and soil fertility would provide valuable information for both producers and consumers, as suggested in the Panel's recommendation on research into the long-term effects of agricultural chemicals (Section 5.4.1).

3.3.5 Acidification

Soil acidification due to agricultural practices occurs mainly as a result of fertilizer use. Most synthetic fertilizers contain only three major elements in variable proportions: these are nitrogen, phosphorus, and potassium, although sulphur fertilizers are also commonly used in parts of Alberta. Nitrogen is the most universal limiting plant nutrient, and thus the element which is most commonly applied. Fertilizers containing nitrogen and sulphur are the ones most likely to contribute to soil acidity.

Increased soil acidity can have several effects. Many soil micro-organisms that are essential to the processes of decomposition and nutrient cycling function poorly in acidic conditions. At the same time, some soil pathogens, particularly fungi, prefer acidic conditions and may become more difficult to control. Also, the effectiveness of some pesticides is reduced by increased acidity. Finally, increasing acidity mobilizes some elements that are potentially toxic to plants while making unavailable some of the elements which are essential for plant growth. Aluminum, for example, is a toxic metal that occurs naturally in soil but is not normally available to plants under neutral conditions. Calcium, magnesium, and potassium, on the other hand, become less available in acidic soils.

Most of the major crops in western Canada are sensitive to soil acidity, with alfalfa and barley being among the most sensitive. Of the Prairie provinces, Alberta has the largest area of acid and potentially acid soils. Some soils in this province are naturally acidic. Between 1962 and 1972, on the basis of soil testing results, it was calculated that 16 percent of cultivated soils were acid (Penney et al. 1977); excluding the Peace River region, there are nearly 1.4 million hectares (3.5 million acres) of acid soils in Alberta, with another 2.3 million hectares (5.7 million acres) that are potentially acid (Hoyt et al. 1981). In the Peace River region of Alberta and British Columbia, 31 percent of the land base has acid soils; this amounts to over 0.5 million hectares (1.2 million acres) that are acid and another 0.6 million hectares (1.5 million acres) that are potentially acid (Hoyt et al. 1981).

There are basically two alternatives for reducing yield losses due to soil acidity. One is to grow crops that can tolerate acid soils. Oats and some other grasses fall into this category, but they may still experience nutrient deficiencies which require fertilizer additions. Furthermore, the selection of tolerant crops is very limited, and this approach is probably best considered a temporary measure. The other choice is to apply lime to alter the soil pH and neutralize soil acidity. Liming is an agricultural practice which has been widely used for some time in other areas, with acceptable results. It is, however, expensive when the cost of transportation as well as the costs of extraction and application are included. Hoyt et al. (1981) calculated the total cost of liming to be between $30 and $40 per tonne ($27-$36 per ton). They also calculated that if 25 percent of the nearly one million tonnes of fertilizer used annually in Alberta is applied to acid soils, then about 250,000 tonnes (276,000 tons) of lime would be required to neutralize the acidity caused by the fertilizers, at a cost of between $8 and $11 million.

The Government of Alberta introduced the Agricultural Lime Freight Assistance Program in 1981 to assist farmers with acid soils with the cost of lime or marl transportation. The program provides a grant of 80 percent of the cost of transporting marl or agricultural lime in excess of $5.50 per tonne to a maximum of $15,000, with maximum assistance fixed during any one fiscal year. During the 1982-83 fiscal year, there were 100 applications for assistance; the government spent $378,000 assisting with the transport of 13,200 tonnes (14,600 tons) of lime (Alberta Agriculture 1984: unpublished data).

3.3.6 Synthesis

When it comes to soil conservation, the effective bottom line is economics. Our economy is geared to measure the relative values of products and means of production through the pricing mechanism. Comparisons of revenues and costs indicate optimal production practices. Economic theory predicts that individual producers will use land in such a way that they optimize their benefits from the land, but society also expects the land resource to generate an optimum stream of benefits (PFRA 1983). Conflicts occur when the goals of the individual producer (which have tended out of economic necessity to be short term) and those of society do not mesh. There are many reasons to expect an individual producer to adopt management, cultural, and conservation strategies significantly different from those society would prefer. Individuals and society have different goals and incentives to which they are responding. For example, individual producers may set as their goal a lower level of soil conservation than society would have them set. Individuals are often constrained by financial limitations from practicing conservation.

Government has supported soil conservation programs through both legislation and financial assistance. However, existing legislation is not used often enough or early enough to be fully effective. The Soil Conservation Act and the Agricultural Service Board Act embody most of the specific Alberta legislation dealing with soil conservation and land degradation. This legislation encourages the adoption of soil conservation practices and addresses the loss of soil and soil productivity through negligence and misuse. The Soil Conservation Act applies the principle of ownership responsibility, specifying that every person who owns, occupies, or controls land shall take active measures to prevent soil deterioration by wind, water, or any other cause. This Act also requires that conservation officers be appointed by local councils in every jurisdiction to administer the Act. It empowers municipalities to develop permits for some situations which lead to soil degradation, such as topsoil removal and burning of stubble. However, no control is specifically provided for other damaging practices.

The Agricultural Service Board Act provides for the establishment of Agricultural Service Boards in a municipality to assist the local council and the Minister of Agriculture; these Boards provide advice on various matters relating to agriculture, including weed control and soil and water conservation. The Boards also have authority under the Act to supervise the rehabilitation or reclamation of farmlands which have seriously degraded soil. Together these two pieces of legislation have great potential power over a landowner's treatment of land. There is no lack of authority to control soil degradation in the existing Alberta Acts, instead the powers provided seem to be excessive for all but the very worst of situations. Consequently, mild problems or those at an early stage tend not to be tackled, though it is at this stage that they could be most easily handled.

In addition to the programs discussed earlier, other forms of assistance and cost-sharing programs are available to farmers, usually through a local body such as the Agricultural Service Board. The Soil Conservation Area Program (SCAP), administered by Alberta Agriculture, was established in 1972 and provides 60 percent cost-sharing grants to Agricultural Service Boards undertaking programs that relate to soil erosion and soil salinity. In 1983-84, 42 Agricultural Service Boards participating in soil erosion programs were allocated $332,824, while five Boards undertaking soil salinity projects received $25,380 (Alberta Agriculture 1984: unpublished data). Although these programs are intended to be both preventive and rehabilitative, it is probably fair to say that most have been undertaken to try to remedy serious soil problems rather than prevent them. Additional funding is provided by Alberta Agriculture to the Service Boards for other projects related to maintaining agricultural production, but these are in areas other than soil conservation.

Alberta Environment also provides funding and technical assistance for soil conservation projects related to erosion and water management. The Northwest Alberta Erosion Control Program has handled four to five projects per year since its inception in 1978; in 1982-83 the total budget for operations, maintenance, and rehabilitation was $1.3 million. This program comes under the broader statement in Position Paper No. 5 relating to Cost Shared Water Resource Management Projects of Alberta Environment; about 50 percent of the $7 million budget is used for projects which address surface water problems on agricultural lands (Alberta Agriculture 1984: unpublished data).

There is unquestionably concern in Alberta about the degradation of our agricultural soils. The Panel believes that soil deterioration is closely linked to the system of commodity production. This system includes all of the interacting parts of the agricultural industry, implying that it is impossible to achieve a reduction in the rate of soil degradation without addressing many areas of commodity production and use. Many of these essentially economic and marketing issues are addressed in recommendations elsewhere in this report.

The Panel also believes that the Agricultural Service Boards should play a major pro-active role in matters related to soil conservation. Through the Agricultural Service Board Act, the existing responsibility for the conservation of the agricultural land base rests with the municipality, though much of the funding originates from Alberta Agriculture. The Panel sees no reason to change that responsibility. However, though the Agricultural Service Boards have all the power necessary to respond to conservation disasters or crises, they do not have the ability to be pro-active, to prevent degradation through the identification of sensitive areas, through assisting local soil conservation groups to develop programs, or through the ability to prevent agricultural development when it is clear that it will result in future erosion or soil degradation. To assist the Agricultural Service Boards in taking a pro-active role, the Panel makes the following recommendation.

It is recommended "that an agricultural land use classification be developed that identifies the ability of the soil to be continuously utilized for different types of agriculture without major degradation." Most soil degradation of agricultural land can be traced to some agricultural practice that is not compatible with the soil type, topography, or climatic conditions of the area. Land that is particularly subject to soil degradation under cultivation should be identified on a priority basis.

Such a land classification system might include the following categories:

1) Arable Land

    a) Capable of most types of agricultural production.

    b) Capable of being cultivated with forages in rotation and special management practices.

2) Grazing — crops should be restricted to grasses or forage crops because of potential erosion or soil degradation problems.

3) Conservation Cover — the danger of erosion or soil degradation is so severe that only cover appropriate to the area (grass, brush, trees), with limited grazing, should be permitted.

The Panel believes that the identification of such land to the public has a great potential to develop awareness of sensitive areas requiring protection for conservation purposes. The affected landowner should also be involved and able to comment on the validity of the proposed classification. The adoption of this type of land use classification should be subject to the same requirements as provided for land use bylaws. The Planning Act sets out a comprehensive form of notification and public and individual owner input, both in the enactment of the initial land use bylaw and amendments thereto. This should be paralleled in the adoption of an agricultural land use classification.

Such a classification system could perhaps overcome some of the problems associated with the Canada Land Inventory (CLI) and would also help local authorities in addressing land use issues. This system is critical to developing a pro-active approach, which anticipates possible problems and then allows for alternatives to be assessed before action is taken. The Panel believes that many land use decisions with potential for causing soil degradation could be avoided if the following recommendation were adopted: "an agricultural development permit, issued by the Agricultural Service Board, should be required to clear or break land. Permits could identify special conditions under which clearing or breaking should take place."

Certain areas, as identified by the classification system described above, may be inappropriate for some forms of agriculture. The local Agricultural Service Board, supported by information from the proposed land classification system, should be in a position to assess whether the long-term impact of clearing or breaking land would be sufficiently detrimental to warrant the refusal of a permit to clear or break, or to establish special conditions under which clearing or breaking should take place.

A right of appeal to the municipal council and the courts should be provided for those instances where permits are refused or issued with conditions unsatisfactory to the applicant.

Representatives from various informal conservation groups came before the Panel to discuss their own experiences and solutions to their local problems. The Panel was impressed with the enthusiasm, dedication, and ability of these groups, and believes that their authority and ability could be strengthened without diluting their great strength, their local knowledge of the problem and the people. The Panel therefore recommends "that there be provision for the establishment of Soil Reclamation Districts, whereby two-thirds of the landowners within defined boundaries may determine the remedies necessary to arrest soil degradation and/or reclaim lands presently subject to degradation. Within Soil Reclamation Districts, constant dollar or low-interest loan funding should be available to help carry out remedial measures, with repayment to be compatible with benefits derived."

Soil degradation by wind, water, and cultural practices is an important factor presently reducing the productivity of the agricultural land base, and has the potential to become a major factor in Alberta's ability to maintain or expand agricultural production.

Most soil degradation can in one way or another be traced to farming practices, and is localized in nature. Therefore the problems should be resolved locally, based on the will of a substantial majority.

Assistance in the development of Soil Reclamation Districts should be provided by way of constant dollar or low-interest loans which could, when costs are particularly high, be forgivable in whole or in part. It is the Panel's belief that, in most instances, the benefits to be achieved from soil reclamation would be sufficient to repay constant dollar or low-interest loans.

The establishment of a Soil Reclamation District, the development of a reclamation plan, and the approval of loan amounts and repayment requirements would be subject to the approval of the local Agricultural Service Board, with provision for appeal to the municipal council.

There are other major impediments to effective soil conservation that lie beyond the ability of the rural municipality to change. These relate particularly to federal and provincial programs that provide an incentive to summerfallow. Summerfallowing has been identified as a practice that hastens the loss of organic matter and nitrogen in Prairie soils, has been implicated in the spread of dryland salinization, and leaves soils more susceptible to wind and water erosion. It is clear that this old, established, Prairie farm management practice should be reduced as much as possible.

In the short term, there is a clear economic penalty to the elimination of summerfallowing, particularly when it may take up to five years to accumulate sufficient organic matter through continuous cropping to compensate for the reduction of yields. It was brought to the Panel's attention at the public hearings that the way in which the Wheat Board quotas were established still, in spite of substantial improvement, provides an incentive to summerfallow and to break marginal land that should remain in pasture.

The Panel supports the recommendation in the report on soil conservation by the Standing Committee on Agriculture, Fisheries, and Forestry, to the Senate of Canada, reading "that the Canadian Wheat Board modify the quota system to extend (a) full quota entitlement, at the "bonused" level of seeded acreage, to those remnant farmlands considered of marginal value for agriculture; and (b) partial quota entitlement, equivalent to current quota levels for summerfallow, to extensive tracts of unimproved pastureland which form integral parts of farm units" (Standing Committee on Agriculture, Fisheries, and Forestry 1984:12).

The Panel believes that this recommendation could lead to better use of the Prairie soils and urges the provincial government to fully support this recommendation.

The crop insurance program also provides an incentive to continue summerfallowing. On average, crops seeded on stubble have lower yields than those seeded on summerfallow, though there has been a tendency for these yields to converge recently (see Figure 1). Therefore crop insurance coverage for farmers who plant on stubble is not as high, nor will payments be as large or start as early in case of a crop failure. A good farm manager who plants on stubble and provides the necessary inputs can often achieve yields that rival those on summerfallow, though at higher input costs. Unfortunately, because statistics for yields on stubble are distorted by those who plant without the necessary inputs, he is penalized two ways. He faces higher input costs to achieve his higher yields and, in case of a crop failure, would collect less from crop insurance. It is possible to establish an individual risk assessment for crop insurance purposes which can partially overcome this problem, but the farmer planting on stubble who experiences widespread crop failure early in the individual program would be faced with excessively high premiums.

Consequently, the Panel recommends that "the method of calculating coverage and payouts should be neutral as between planting on summerfallow or stubble. Since there are many technical details and complications in achieving this objective, the Panel calls on the Canada-Alberta Crop Insurance Corporation to give this matter their urgent consideration."

Summerfallow is known to be detrimental to soil quality in the long term, and the Panel believes that it is undesirable for a government-assisted program to support or encourage such farming practices.

CHAPTER 4

NORTHERN EXPANSION OF THE AGRICULTURAL LAND BASE

Many factors influence the decision of whether to expand our agricultural land base. During the public hearings, there were presentations both in favor of and in opposition to northern expansion. This chapter of the report reflects the range of opinions presented and considers the feasibility of agricultural expansion in northern Alberta.

4.1 Climate

The climate of northern Alberta puts limitations on agricultural production, a fact on which several hearing participants commented (16, 104, 127, 150, 153, 191, 256). Most of the comments were little more than simple recognition of the climatic constraints associated with agriculture in northern Alberta, although one presentation expressed grave doubts about the climatic suitability of the area by describing it in terms such as ''severe'' and ''unpredictable'' (153). Due to reservations about climate in northern Alberta, it was thought by some that large-scale expansions should only occur after the climatic suitability for agriculture has been established (224, 274). Information presented in briefs 8, 230, 248, and 254 suggested that in fact the climatic suitability of northern Alberta for crop production may improve if more land is cleared.

To overcome some of the difficulties of comparing climates of different regions on the basis of single characteristics such as temperature and precipitation, maps have been produced which make the comparison based on a summary of climatic characteristics. Figure 4, for example, shows the agro-climatic regions of Alberta, that is, regions having similar characteristics for cropping purposes. The main agro-climate of the Peace Region (3H) differs from most (but not all) parts of central and southern Alberta; the most notable exception is the thin strip of 3H agro-climate extending from west of Edmonton to south and west of Calgary. Also notable is the similarity in agro-climates of the Peace River region and southeast Alberta, the main difference being that frost limits production in the north, and moisture limits production in the southeast. Small-scale maps such as this one, however, are not suitable for deciding whether individual parcels of land in northern Alberta have climates which permit profitable agriculture.

Extensive studies of the climate of the fringe areas in northern Alberta are now being conducted by the Resource Evaluation and Planning (REAP) Division of Alberta Energy and Natural Resources. These studies have been underway for only five years and are not complete. Once completed, this new information should provide decision makers with much better information than that which currently exists.

4.2 Soils

During the hearings, several participants expressed reservations about expanding agriculture in northern Alberta on the basis of the marginal quality of the soils available for use (16, 104, 127, 150, 190, 224, 256). One comment was that the light soils of the region could make northern farmland more susceptible to wind and water erosion (276). Most of the briefs that addressed the issue suggested that the land available for expansion was CLI Class 4 or poorer. Better soils were said to exist in land desired for northern expansion (139, 150, 195), but much of this land was felt to be too isolated or fragmented to be economically developed (139, 195).

AGRO-CLIMATIC AREAS OF ALBERTA

LEGEND

This map delineates areas that have, on the long-term average, similar climatic characteristics for cropping purposes. It is an attempt to provide a general guide in determining the range of crops that, as a result of a combination of climatic factors, can be satisfactorily grown in each area. It must be emphasized that climate is only one of the physical factors that influence the range of crops grown; there are others, particularly soil type and topographic features.

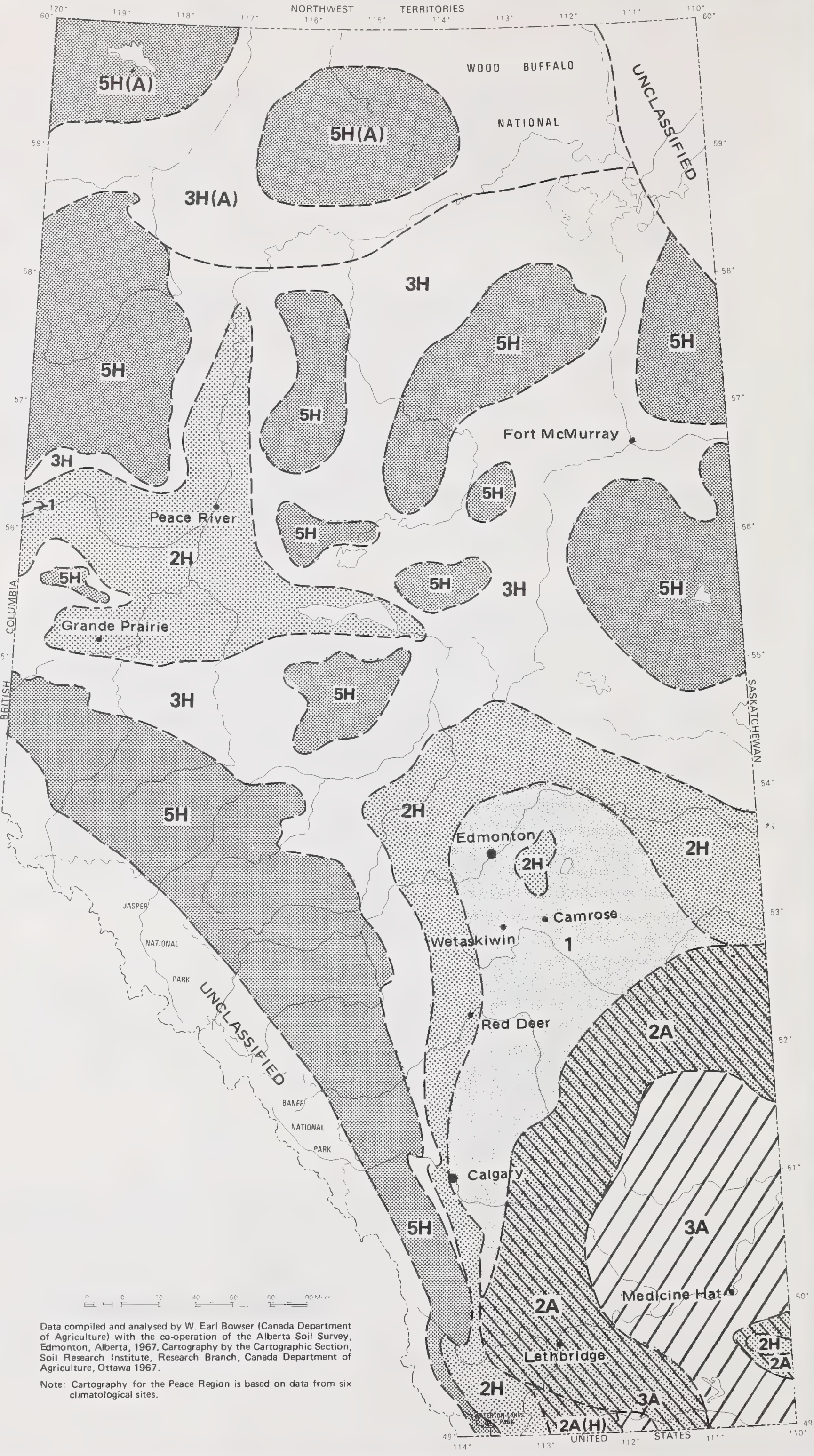
THE LINES DIVIDING THE AREAS ARE USUALLY BROAD TRANSITION BELTS; RARELY IS THERE A SHARP CHANGE IN CLIMATE FROM ONE AREA TO ANOTHER.

The area boundaries are delineated by broken lines to indicate that they are subject to change when additional data becomes available. Local topographical features and proximity to lakes and muskegs can cause local conditions: cold "frost pockets"; exceptionally good air drainage with longer than normal frost-free periods; warm belts; areas with heavy dew formation; and areas with more or less precipitation than the average for the larger area. These conditions may differ significantly from the average for the area but cannot be shown on a map of this scale. The frost-free data quoted in the area descriptions are long-term averages. It is recognized that throughout most of Alberta the average frost-free period since about 1950 has been significantly longer than for the period of record before that date. For the purpose of this map, however, the 1950-1965 period has been considered as an anomaly and not as a trend.

The map was compiled in collaboration with members of the Alberta Soil Survey using information taken from: (1) publications of the Meteorological Service of Canada, (2) *Climates of Canada for agriculture.* CLI Report No. 3 by Chapman and Brown of the Ontario Research Foundation, (3) *The frost-free period in Alberta* by R. W. Longley of the University of Alberta, (4) data and observations gathered by members of the Alberta Soil Survey, and (5) observations by grain elevator agents and federal and provincial field personnel. Recognition is also given for suggestions and data provided by Dr. A. Leahey, G. W. Robertson, and J. Day, of the Canada Department of Agriculture, Ottawa. The map was initially compiled to assist the Soil Survey to determine the capability of Alberta soils for agricultural use. The Arabic number designation of the areas indicates relative capability 1 being top, or best. The subscript A (aridity) indicates that moisture is the limiting factor. The subscript H (heat) indicates that such factors as summer heat units, frost-free periods, and days between peak summer rainfall and first fall frost, are limiting factors.

1	Areas where the amount of precipitation has usually been adequate and the frost-free period long enough to permit the growing of all the dryland crops that are typical to the Prairie Region of Western Canada. The frost-free period in these areas has averaged over 90 days and the annual precipitation has averaged 16 to 18 inches
2A	Areas where the amount of precipitation, in approximately 50 percent of the years, has been a limiting factor to crop growth. The frost-free period has usually been long enough for wheat to mature without frost damage. In the 2A(H) area south of Lethbridge there is some frost hazard
3A	Areas where the amount of rain has usually been a severe limiting factor to crop growth; a wheat-fallow rotation is practiced to the virtual exclusion of all other rotations. The annual precipitation has averaged 12 inches. The frost-free period has averaged slightly over 100 days in the northern portion of the area and over 115 days in the south central portion. Wheat is rarely damaged by frost and sweet corn can be grown, under irrigation, in the southern portion
2H	Areas where the amount of precipitation has usually been adequate but where wheat has suffered some frost damage in approximately 30 percent of the years. The frost-free period has averaged between 75 and 90 days
3H	Areas where the amount of precipitation has usually been adequate but where it is not considered practical to grow wheat because of the frequency of damaging frosts. In the areas south of Latitude 55° N the average annual precipitation has averaged 17 to 19 inches. Going north from Latitude 55° N there is a gradual drop in precipitation and at Fort Vermilion the annual average is between 12 and 13 inches.*
5H	Areas where the amount of precipitation has usually been adequate but where the average frost-free period has been so short (generally less than 60 days) that it is not practical to grow cereal crops, that is, hay crops are all that are recommended.*
UNC	Mountain complex and Precambrian Shield. There is little to no agricultural potential in these areas

*The portion of the province north of Latitude 58° N has an average annual precipitation of less than 14 inches. In most of this area rainfall, or lack of rainfall, may be an additional limiting factor to crop growth in a significant number of years. Therefore the 3 and 5 areas that, in general, lie north of Latitude 58° N are given the limiting subscript A in addition to H, i.e., 3H(A) and 5H(A).



Data compiled and analysed by W. Earl Bowser (Canada Department of Agriculture) with the co-operation of the Alberta Soil Survey, Edmonton, Alberta, 1967. Cartography by the Cartographic Section, Soil Research Institute, Research Branch, Canada Department of Agriculture, Ottawa 1967.

Note: Cartography for the Peace Region is based on data from six climatological sites.

Figure 4 Agro-climatic areas of Alberta

Nevertheless, there was a range of opinion about soil capability in the expansion areas of northern Alberta that extended from the pessimistic to the optimistic. The opening of new lands was not opposed, provided the soils had good agricultural capability (70). It was acknowledged that there are problems with using the CLI classification, but it was claimed that soil scientists are becoming increasingly optimistic about the soils in the area (254). Other participants were also optimistic about the capability of soils to support expanded agriculture in northern areas (147, 229, 265).

At present it would appear that sufficiently large amounts of CLI Class 4 or better lands exist to sustain expansion for some years to come. An estimated 1.7 to 3.5 million acres of CLI Class 2 to 4 land remain undeveloped in the Yellow Area, and CLI data suggest there may be nearly 9 million acres of potential agricultural land in the Green Area of the Peace region (139). The prospects for finding sufficiently large blocks of CLI Class 2 to 4 land suitable for agricultural expansion are therefore fairly good. Furthermore, even some poorer lands may be used for grain production, since over a period of time the soils could be built up with forages to the point where they could produce grain crops (134). There is some evidence from the climatological work being conducted by REAP in northwestern Alberta that lands now designated as CLI Class 5 with climatic limitations between 1,200 and 2,500 feet elevation could be raised to CLI Class 4 with topographic or other limitations. The area affected covers approximately 500,000 acres within the lower Peace region. The classification of other areas may be downgraded with the better climatic information (S. Dupuis 1984 pers. comm.).

4.3 Production

Due to climatic and soil limitations, the range of crops which can be grown in northern Alberta is considerably less than in many parts of central and southern Alberta. Furthermore, the yields (and general quality) of grain crops grown in the Peace River region are less than those of many parts of central and southern Alberta (Table 35). The yields in the 2H

Table 35. Average yield* of wheat, oats, and barley in different agro-climatic areas of Alberta

	Southern and Central Alberta					Peace River	
	1	2A	3A	2H	3H	2H	3H
Wheat	100	89	60	85	72	71	35
Oats	100	95	67	97	112	76	60
Barley	100	102	62	92	95	65	65

*As a percentage of yield in agro-climatic area 1.

Source: Alberta Energy and Natural Resources 1983c: Table 5 agro-climatic regions of northern Alberta (Figure 4) are somewhat better than the 3A regions of Alberta (that is, southeast Alberta) but the yields of grain crops in the 3H agro-climatic regions of northern Alberta, which include many of the areas identified for agricultural land base expansion, are the lowest in the province. Alberta Agriculture estimated that crop yields in the north are from 8 percent to 30 percent below yields on similarly rated soils in the central and southern regions; this is illustrated in Table 36. This table shows, however, that in certain years yields in northern Alberta may exceed the provincial average, for example, wheat and oats in 1979. Furthermore, there is evidence that from 1956 to 1980 the difference between average yields in the Peace River region and those in the rest of the province decreased (Kelly and Moreau 1982). Thus, it appears the difference in yields between northern and southern Alberta is not so great as to destroy the prospects of a farmer making a livelihood in northern Alberta.

Compared to farming operations in central and southern Alberta, few livestock are raised in the north. Distance from market, predator problems, and biting insect infestations (181) are among the elements working against northern livestock operations. Livestock production in northern Alberta is less profitable than in the rest of the province, and livestock enterprises are less concentrated than in central and southern Alberta because off-farm income is an integral part of northern farming (3, 5, 7, 9, 139); farmers cannot commit themselves to the year-round job of raising livestock, especially when it is generally less profitable than working in the off-season in the forestry or oil and gas industries (4). It was suggested that off-farm income has inhibited the development of successful or efficient farm operations (119, 266). Staying on the farm year-round to raise livestock, and using forage rotations to build up the soil fertility in marginal soils represent the kind of difficult strategies necessary to maintain and enhance northern soils.

4.4 Economics of Farming

The Northern Alberta Development Council (NADC) commissioned a study on the subject of agricultural expansion in northern Alberta entitled *The Development of New Agricultural Land in Northwestern Alberta* (Woods Gordon 1983). Woods Gordon estimated the profitability of farming in those northern areas where most of the pressure for expanding the land base exists; the return to equity, labor, and management for a small farm (300 cultivated acres) was $2,800 annually, whereas the return on a larger farm (748 cultivated acres) was $6,700 annually, based on labor/management costs of $20 per acre. By temporarily ignoring depreciation, the short-term disposable income increases to $6,900 and $21,000 per year for small and large farms respectively. Off-farm income improves the economic position of the northern Alberta farmer. This income added to net farm income brings the total income to $20,000 and $30,000 for farmers working small and large farms respectively.

The situation for first-time farmers who are breaking new land is difficult. For beginning farmers, off-farm income is a virtual necessity for their entire working life in order to meet the capital requirements of the farm and to provide a living allowance (Ibid.). The real gain for the beginning farmer, however, is the capital gain in the value of the land which can be realized upon retirement. The estimates in the Woods Gordon report were for beginning farmers with above-average farm skills. For less skilled farmers, the result is often failure.

Table 36. Crop production in northern Alberta compared with the province as a whole

Crop	Acres Seeded			Total Production			Yield / Acre			
1979	CD 15	Province	CD 15 as % of Province	CD 15 (tonnes)	Province (tonnes)	CD 15 as % of Province (kg)	CD 15 (kg)	or ARA 7 (rank)*	Province (kg)	Highest Dryland (kg)
Wheat	318,000	5,200,000	6.1	290,000	4,028,000	7.2	910	(3/13)	775	1,030
Oats	90,000	1,250,000	7.2	84,000	1,126,000	7.5	935	(4/13)	900	1,040
Barley	710,000	4,550,000	15.6	648,000	4,550,000	14.2	915	(9/13)	1,000	1,135
Canola	1,161,700	3,500,000	33.2	402,500	1,440,200	28.0	345	(7/8)	410	505
1980										
Wheat	643,000	5,900,000	10.9	549,000	5,334,000	10.3	855	(8/13)	905	1,100
Oats	111,000	1,300,000	8.5	101,000	1,265,000	8.0	910	(9/13)	975	1,095
Barley	870,000	5,350,000	16.3	789,000	5,857,000	13.5	905	(12/13)	1,095	1,190
Canola	712,800	2,200,000	32.4	323,300	1,134,000	28.5	455	(6/8)	515	570
1981										
Wheat	693,000	6,700,000	10.3	540,000	6,221,000	8.7	780	(8/13)	930	1,160
Oats	162,000	1,300,000	12.5	122,000	1,249,000	9.8	755	(12/13)	960	1,230
Barley	1,109,000	6,450,000	17.2	831,000	6,967,000	11.9	750	(13/13)	1,080	1,340
Canola	468,800	1,450,000	32.3	183,000	759,800	24.1	390	(7/7)	525	680
1982										
Wheat	770,000	6,850,000	11.2	482,000	6,137,000	7.9	625	(13/13)	895	1,130
Oats	135,000	1,400,000	9.6	105,000	1,403,000	7.5	780	(12/13)	1,000	1,140
Barley	1,144,000	6,200,000	18.5	865,000	6,684,000	12.9	755	(13/13)	1,080	1,240
Canola	527,200	1,850,000	28.5	193,100	929,900	20.8	365	(7/7)	505	630
1979-82 Average								(bu/ac)		
Wheat	606,000	6,162,500	9.8	465,250	5,430,000	8.6	792.5	(21.1)	876.2	1,105
Oats	124,500	1,312,500	9.5	103,000	1,260,750	8.2	845	(54.8)	958.7	1,126.2
Barley	958,250	5,637,500	17.0	783,250	6,014,500	13.0	831.2	(38.1)	1,063.7	1,226.2
Canola	717,625	2,250,000	31.9	275,475	1,065,975	25.8	388.7	(17.1)	488.7	596.2

Source: Alberta Agriculture, *Agriculture Statistics Yearbook* 1980, 1982

CD — Census District. There are 15 CDs in Alberta. (It should be noted that the statistics used to compile this table lumped CDs 6 and 9 together as well as CDs 13 and 14.)

ARA — Agricultural Reporting Area. In 1979-80 there were eight; in 1981-82 there were seven. CD 15 corresponds roughly to ARA 7.

* The figures in the third column from the right indicate the ranking of Census Division 15 (ARA 7) in relation to other areas. For example, 3/13 means that Census Division 15 had the third highest yield per acre of the 13 areas recorded.

A handful of briefs addressed the economic hardships faced by the individual farmer. A particularly bleak picture of the homestead farmer and an appeal against the hardship and suffering that would be encountered by opening up large tracts of land for settlement were presented in brief 274; similar appeals were echoed in briefs 153 and 181. Historically, only one homestead in three has been successfully brought into production by the original homesteader (142). The experience of eastern Canadian provinces has been that large human populations have become stranded at the poverty level in regions of marginal agricultural potential (137, 276) and there is evidence that abandonment of marginal lands is occurring in the Peace River area (151). However, it was suggested that the success rate of beginning farmers and homesteaders will probably increase (7).

4.5 Government Expenditures

Several briefs presented during the hearings questioned further agricultural expansion in the north when there are increased costs to government (163, 181, 185, 204, 274). The arguments against expansion presented by IDs 19 and 20 (148) and the Agricultural Development Committee of ID 19 (153) were very persuasive. Some presenters recognized the costs of expanding the land base and suggested that the land be used in a cost-effective manner (14, 104, 146, 165, 209, 256). It was suggested in brief 135 that only Crown lands adjacent to existing operations should be brought into production to help ensure the viability of existing farms. Other participants advocated expansion of the land base in northern Alberta despite the costs for the people of Alberta (139, 147, 225).

The cost estimates developed in the Woods Gordon study were based on 154,000 acres of land being opened up per year for the next 20 years. The study concluded that, over 50 years, the cost to the Alberta government using a 5 percent discount rate would be $663.634 million (Woods Gordon 1983). The costs included such items as road construction, drainage improvements, and increases in government services which would be required for expansion at a rate of 154,000 acres per year. Direct revenues were estimated at $134.8 million; Woods Gordon (Ibid.) estimated benefit/cost ratios to be from 1.63 to 4.47, suggesting that anticipated benefits to northern urban communities would outweigh the costs in farming areas. The presenter of brief 1 also commented on the benefits to northern communities of opening new land.

Forestry industry representatives who spoke at the hearings alluded to fears that transfer of substantial amounts of land from forestry to agriculture would endanger the economics of forestry in northern Alberta (14, 130, 154, 163). For the many communities and individuals in the area who depend on forestry for a livelihood (including the many homesteaders who depend on income from forestry to clear their land), the economic consequences could be severe. It was argued that the forest industry generates greater economic spinoffs than agriculture (139; Ibid.) without heavy provincial expenditures for infrastructure (14, 163), and that the number of acres needed to support one permanent direct job compares favorably with agriculture in northern Alberta (154, 163), while still permitting multiple use of the land. Bigsby (1983) has argued that the economic benefits accruing to society from agricultural development of forested lands are negative or much lower than that of forestry in Northern Alberta. Resource management is controversial due to the different values people place on resources and the varying methods of measuring or quantifying these values.

Arguments presented during the hearings were not always stated as either agriculture or forestry propositions. The NADC did not advocate exclusion of the forest industry for the sake of expanding the agricultural land base; rather, the NADC felt that both land uses could be accommodated with proper land use planning (139). One presenter stated that expansion of northern agricultural lands would not be in conflict with forestry interests since the better lands for agriculture are covered by aspen, a tree species which is not being used by the forest industry (147). Forestry interests pointed out, however, that aspen-covered lands often represent an early stage of ecological succession to stands of desirable softwood timber (137, 163), and that aspen is capable of being used by the industry (154). Procter and Gamble (Cellulose) Ltd. and the Alberta Research Council are now conducting research aimed at finding uses for aspen. One presenter suggested that before using more Green Area land for agriculture, land in the Yellow Area held by forestry and not suitable for commercial operations be used (141).

4.6 Environmental Considerations

Several hearing participants commented on the environmental implications of clearing land in northern Alberta (2, 6, 126, 127, 139, 144, 158, 164, 224, 248, 276). In some cases the types of wildlife species may change with land clearing; for example, some of the populations of larger mammals such as elk and moose would probably decrease and be replaced by white-tailed deer. The latter have less hunting value, and there is a possibility that northern Alberta could become less attractive to hunters from outside the area, thus reducing income to local businesses which rely on tourism. As well, competition among local hunters for game could increase.

Northern expansion of agriculture would lead to increased wildlife/agriculture interactions, which ultimately have an economic price tag. Grain losses to waterfowl are likely to increase, as well as losses of livestock to predators native to the area (131, 164). Expansion would also lead to a loss of hunting and trapping opportunities for the Indian and Metis people of northern Alberta (6).

In addition to its impact on wildlife, land clearing would have significant effects on the water regime of northern Alberta. Terrain and soil characteristics predispose much of the area to water erosion, and once the native cover is removed, serious erosion problems can occur (148, 248). In ID 20, for example, there are scattered sections of land totalling roughly two townships (72 sections) which should never have been brought into production due to major flooding and erosion problems (148). The Peace area is naturally poorly drained, and much time and money have been expended by local agencies and provincial government departments, especially Alberta Environment, to deal with drainage and runoff. Woods Gordon (1983) calculated that, based on 1980 dollars, on a gross acreage basis every acre of land improved for agriculture requires \$50 to \$150 in drainage developments, plus annual maintenance of 2 percent of capital costs per acre (that is, \$1 to \$3 per acre per year). Rehabilitation costs were calculated at 10 percent of the capital costs every 10 years (that is, 1 percent per acre per year or \$.50 to \$1.50 per acre per year). Alberta Environment is responsible for the bulk of these costs. One comment was made during the hearings that drainage funds should be used for existing deeded lands with high potential productivity rather than for development of peripheral lands which are costly to service (124).

The negative effects of expansion on the environment can be mitigated, but the mitigation depends heavily on good integrated management plans. In many cases what is good from an environmental point of view makes economic sense. For example, the most critical habitat for ungulates is the river and stream valleys of the Peace region (Ibid.); considering the steep slopes and therefore the erodibility of soils in these areas, considerable amounts of money to control erosion and important wildlife habitat could be saved if creek and river valleys were left in a natural state. In recognition of the environmental values associated with river valleys, it was recommended to the Panel that clearing be avoided in these areas (158, 164, 224), and that some natural vegetation be left between cleared areas (94), especially if soils are marginal (144, 158, 164).

4.7 Land Allocation Procedures

The general procedure for allocating public lands was described in Section 3.2.1. The following discussion presents comments made about the land allocation process, in particular those comments made by northern Albertans.

Complaints about the land posting process were raised during the public hearings. For example, it was recommended that the length of time for completion of Integrated Management Plans be shortened (139). Explanations for the length of time to complete these plans were offered (139). A ministerial advisory committee (the Alberta Integrated Planning Advisory Committee, consisting of representatives from nine interest groups such as the Canadian Petroleum Association, Unifarm, and the Alberta Wilderness Association) has been established. This committee speeds up the management planning process by encouraging input from the very beginning of the process in order to avoid strong objections just prior to implementation of the plans. Presentations which appealed for thorough analysis of the suitability of a region for agricultural expansion (14, 127, 130, 163, 164, 165, 181, 224, 225) including some from residents of northern Alberta, suggested that any reduction in thoroughness by speeding up the planning process would be counterproductive.

The time taken to allocate land after it is posted drew more criticism than the time taken to post the land. All of this criticism came from residents of northern Alberta, many of whom have tried without success to obtain such land (2, 3, 139, 229). The process of land allocation can be lengthy. Candidates wishing to obtain the posted land are interviewed by Energy and Natural Resources field staff. Thereafter the Public Land Dispositions Branch of the Public Lands Division makes an interim decision on the successful candidate and unsuccessful applicants are given a chance to appeal the decision. Often the decision is appealed, and again all the applicants are interviewed, but this time by the local Agricultural Development Committee. Their recommendation is then passed on to the Land Dispositions Branch. In view of the length of time needed to allocate the land and the ill will that can develop when local farmers sit on committees that have to select from several equally qualified local applicants for land, it was proposed in brief 229 and in the Woods Gordon report (Woods Gordon 1983) that a random draw be used to select a successful applicant from among qualified candidates. Auctioning the available land to the highest bidder was rejected (10, 229) as a means of quickly allocating newly available lands because it would not ensure that local individuals needing the land to expand an operation would get the land they need, since corporations may buy the land for speculative purposes.

4.8 Conclusion

Much was heard about the pros and cons of northern expansion during the public hearings, as has been noted in this chapter. The best evidence available strongly indicates that a great deal of damage can occur to wildlife habitat, forestry potential, and the drainage system, all at a good deal of public expense with little or no real return on the investment required to permit northern expansion. The long-term economic viability of an agricultural industry in the north will require more information about such factors as:

a) opportunities for off-farm employment;

b) a land allocation and road access system that would be more compatible with the topography, drainage systems, land use, and wildlife. A commercial trapping industry would still be viable within an agricultural community if the planning and subdivision of land uses is done carefully and not kept to a predetermined and rigid system of survey as required presently;

c) long-term best use (that is, forestry, agriculture, wildlife habitat, and so on);

d) potential erosion problems due to development;

e) climate;

f) economics;

g) long-term value of aspen forests;

h) predator control.

The Panel therefore recommends ''that northern agricultural land base expansion be limited to the fringes of existing agricultural settlements until more is known about potential expansion areas,'' as listed above.

CHAPTER 5

MAXIMIZATION OF THE AGRICULTURAL LAND BASE

Maximization of our agricultural land base generally refers to methods of obtaining the highest level of production possible in the province of Alberta. In some cases, this would mean improving unimproved land in the existing farm land base; in other cases, it might mean taking measures to increase production on improved land or establishing more intensive forms of agriculture such as greenhouses or feedlots. Outright expansion of the agricultural land base (that is, transferring land from the Crown to private ownership for use as improved or unimproved farmland) is a separate issue from maximization and has been discussed in Chapter 4.

5.1 Land Improvements

As of the 1981 census there were an estimated 49.9 million acres in farms in Alberta. Of this amount 30.9 million acres were improved while 19.0 million were unimproved (Statistics Canada 1982a).

The census definition of improved land includes cropland, improved pasture, summerfallow, and other improved land (barnyards, cultivated lands lying idle, and newly broken land not seeded to crop). Unimproved land includes farm woodlots, areas of native pasture or hay land, brush pasture, grazing land, sloughs, marshes, and rocky land. Unimproved land is not unused land; it includes non-cultivated grasslands that are critical to the livestock industry as a source of low-cost forage. Unimproved land also provides important wildlife habitat ranging from sloughs and potholes critical to waterfowl to brush and winter shelter for deer. Therefore unimproved land cannot be considered strictly as reserve agricultural land waiting to be fully utilized. If unimproved land is brought into cultivation, it will generally be at the expense of some other use, such as range or shelter for cattle, habitat for wildlife, or environmental protection areas along watercourses, steep slopes, or groundwater recharge areas.

The second major point to be noted is that, in the 90 years of active agricultural settlement of Alberta, farmers chose the best land first and within each individual farm the land that was easiest to cultivate and brought the greatest return in production was the first to be utilized. With each year the sloughs that were readily drained, the brush that could be easily removed, the peaty land that could be incorporated with mineral soil were brought into the "improved" category. Similarly, when it was noted that the tops of knolls were being scalped and topsoil lost, or that a watercourse was prone to gullying, such areas were frequently allowed to revert to the "unimproved" category.

Some statistics on acreage added to Alberta's farmland are presented in Table 37. Total occupied farmland in Alberta has increased from 43.3 million acres in 1941 to 49.9

Table 37. Acreage added to Alberta's farmland

From	Occupied	Improved
	(million acres)	
1941 to 1951	1.18	2.01
1951 to 1961	2.77	3.02
1961 to 1971	2.27	3.17
1971 to 1981	0.43	2.49

Source: 1941 data from Thompson 1981b; 1951-1981 data from Statistics Canada 1982a million acres in 1981, an increase of 6.6 million acres. Almost all of the expansion of occupied farmland occurred between 1941 and 1971, 6.2 million acres being added in this period, while from 1971 to 1981 only 0.43 million acres were added. However, the unimproved areas of occupied farmland continued to be improved through to the latest census year. As would be expected, the percentage of the occupied land area that is unimproved has declined (see Table 38).

Table 38. Unimproved farmland as a percentage of total occupied farmland in Alberta

1941	53.5 %	1971	42.5 %
1951	49.9 %	1976	40.0 %
1961	46.6 %	1981	38.0 %
1966	44.3 %		

Source: 1941, 1966, 1976 data from Thompson 1981b; 1951, 1961, 1971, 1981 data from Statistics Canada 1982a

The expansion of occupied farmland seems to have come to a halt.

Table 39. Total occupied farmland in Alberta

	Millions of Acres
1971	49.50
1976	49.93
1981	49.93

Source: Statistics Canada 1982a

This result accords with the findings in the Resource Economics Branch publication *An Inventory of Changes in Alberta's Land Base Between 1976 and 1980* (Birch 1982:29).

Table 40. Summary of agricultural land base changes in Alberta, 1976-80

A. Additions of Agricultural Land

		Acres (thousands)
1.	Public Land Dispositions	371.2
2.	Reclaimed Oil and Gas Wells	13.5
3.	Reclaimed Strip Mines	2.0
	Total Additions	386.7

B. Removals of Agricultural Land

		Acres (thousands)
1.	Non-agricultural Subdivisions	139.8
2.	Urban Annexations	90.9
3.	Roads	25.1
4.	Oil and Gas Wells	103.1
5.	Gas Plants	0.4
6.	Coal Strip Mines	1.9
7.	Public Land Reservation	28.9
	Total Removals	390.1

Source: Birch 1982:29

The additions and removals are in virtual balance, confirming the revised occupied farmland figures shown in Table 39. It is primarily due to public land disposition that occupied farmland has remained virtually stable, the additional public lands released just balancing the agricultural land lost to various non-agricultural uses. However, this balance is deceptive; though the acreages are similar, their quality is not.

Table 41. Land base changes by CLI classes, Alberta 1976-80

	Thousands of Acres		
	CLI Class 1 to 3	CLI Class 4	CLI Class 5 to 7 and Organic
Additions	91.2	172.2	116.8
Removals	182.1	83.7	120.3

Source: Birch 1982:34

The removals take place largely in the settled agricultural areas of the province with a predominance of better quality land; the additions take place primarily in the frontier areas (75 percent in the Peace region) where CLI Class 4 lands predominate.

Whether it is unimproved land in the existing agricultural land base or new land added in frontier areas, at some point the improvement of unimproved land will become more difficult, and the rate at which it is being improved will decline. It has been estimated that the following percentages of CLI agricultural land classes are cultivated:

Table 42. Percentage of CLI Classes in cultivation in Alberta

CLI Class	% Cultivated
1	100.0
2	100.0
3	80.3
4	24.7

Source: Adapted from Canada West Foundation Special Task Force 1980

There are 27.9 million acres of Class 1 to 3 soil in Alberta and 24.5 million acres of Class 4 soil. Up to the present most of the improved (cultivated) land added in Alberta has been Class 1 to 3. Class 1 to 3 soil is generally considered to be arable, while Class 4 land is considered marginal for cultivation. The reason for this classification can be appreciated when the productivity indices for CLI classes in the Prairie provinces are examined.

Table 43. Productivity indices for CLI classes for the Prairie provinces

CLI Class	Productivity Index
1	1.00
2	0.85
3	0.70
4	0.50

Source: Shields and Ferguson 1975

These productivity indices apply within single agro-climatic zones. Between different agro-climatic zones, for example, between southern and northern Alberta, productivity of the same CLI class would differ.

The utility and limitations of CLI classifications should be appreciated. Soil quality is a continuum with the lines between classes not rigid or abrupt, and with admixtures of higher and lower quality soils to be found on every quarter section. CLI categories are general and indicate a tendency rather than a precise and rigid class. It is possible to bring a poorer quality soil to higher productivity, perhaps through the identification of a particular crop that is appropriate for that specific soil (for example, the suitability of steep and stony soils in the Okanagan for grape growing, or the sandy soils of Essex County in Ontario for tobacco). However, the occasional exception does not negate the general conclusion that lower quality soil, as measured by the CLI classification, is more difficult to manage and has lower productivity than higher quality land. As noted previously, it might be possible to improve the productivity of lower quality soils (it is even possible to grow crops successfully in the complete absence of soil through hydroponics), but normally this must be done at a cost that increases as the soil quality declines.

On the basis of past trends in the use of unimproved land, there will be a continued conversion of unimproved to improved land in the future, as much as 4 million acres by 2010 if past trends continue. If the demand for grains and oilseeds increases, while that for beef remains stable or grows only slowly, there would be increased pressure to convert grassland and woodland to cropland. Since most of the Class 1 and 2 land is already being used along with about 80 percent of the Class 3 land, most of the conversion will take place on Class 4 land.

In the international markets which will be available for Alberta's crops (see Section 2.1) the most important factor will be cost of production. Poorer quality lands (such as CLI Class 4) can be made to produce cultivated grain and oilseed crops, but at some cost, in terms of lower yields and at least equal if not higher input cost. All of the cultivation practices required on Class 1 land are also required on Class 4 land, and may take longer or cost more if the Class 4 soil has been downgraded because of topography or stoniness. The yields, however, are likely to be less.

Over the long term the productivity of Class 4 soils can be increased through careful management. However, the same investment of skilled management, input costs, and time applied to Class 1 to 3 lands would bring an even greater reward.

Some of the Class 4 land can be cleared or broken with little or no problem. For example, soils that have been designated Class 4 because of a short frost-free period might present difficulties in maturing a crop frequently enough to provide a reasonable return to farming, but there is no reason to expect that such lands would be subject to unusual problems of degradation or susceptibility to erosion. However, land that has been designated Class 4 because of topography, soil structure (such as solonetzic soils), or excessively fine and light soils, is a different case. Unless such land is cultivated with great care (or at times is planted only to grasses and forages), it would be subject to problems of wind or water erosion or salinization. In the period since Alberta's agricultural settlement began, there has been a continuous testing of land uses that are appropriate for certain climates, topographies, and soils. Much has been learned about how certain soils in specific areas should be handled and what they can be used for, without harm to their productivity and capability.

In the future, the additional land that will be cleared and broken will more frequently be land that was not used previously because there was some problem with it that caused farmers to bypass it or farm around it. With care, the application of local knowledge, and the use of new technologies and equipment, much of the new cropland can be utilized without problem. However, in other cases, land that should not be cleared and cultivated will be subject to erosion or soil degradation if developed.

The Panel believes that the recommendation concerning land use classification presented in Section 3.3.6 addresses these problems.

5.1.1 Reduction of Summerfallow

Summerfallow has been an important part of the soil management system on the Prairies since the manager of the Indian Head experimental station, in the absence of his help who were called up to suppress the Riel Rebellion, summerfallowed fields on the station. The increased yields that resulted in the following year, when the farmhands returned from the wars, were noted and summerfallowing was gradually adopted as the conventional practice for growing grain on the Prairies.

Today farmers summerfallow for four basic reasons:
1) to conserve moisture;
2) to suppress weeds;
3) to release nitrogen from the soil for the following crop;
4) to utilize tillage equipment and the farmer's time in the most efficient manner.

These are all compelling reasons to summerfallow and it was adopted as almost a universal practice on drier soils (Brown and Dark Brown) and was frequently utilized on Black and Grey Wooded Soils. Soil scientists today, however, have identified that its long-term use can lead to increased dryland salinization and to a reduction in organic matter (and thus in tilth), which increases susceptibility to wind and water erosion. Soil scientists also point out that only a small proportion of the moisture that falls on a fallowed field is actually conserved for the next crop and that equivalent moisture conservation can frequently be achieved by retaining stubble to trap snow.

There has been a substantial movement away from summerfallowing and, indeed, at the hearings it was suggested that the movement out of summerfallow may have run its course (72). Anderson (1981) assumed an agro-climatic minimum of summerfallow which is:

Black and Grey Wooded Soil	1 year in 10
Dark Brown Soil	1 year in 5
Brown Soil	1 year in 3

On that basis and given the increased acreage under cultivation, he estimated that the minimum summerfallow acreage will be 4.6 million acres, or about 15 percent of cultivated acreage, in the year 2000 (Anderson 1981:Table 7.4). If there were 35 million acres of cultivated land in 2010, these calculations would suggest that about 5.3 million acres would still be in summerfallow.

If the frequency of summerfallow is to drop, the relative cost of nitrogen fertilizer would have to decline (since without fallowing more nitrogen fertilizer is required) and the relative cost of herbicides would also have to drop, since herbicides would have to be used to eliminate weeds that could have been eradicated by summerfallowing.

It also takes some time for the beneficial effect of continuous cropping to become evident (particularly increased organic matter in the soil). It requires time for the increment of roots and trash associated with plant growth, in what would have been the fallow year, to decompose and be incorporated into the mineral soil. The practical experience of farmers suggests that about five years are required before the benefits of continuous cropping are manifest. Many farmers who attempted to switch to continuous cropping have experienced increased costs for nitrogen fertilizers and herbicides and have had to accept low yields as well. The experience suggests that after five years of continuous cropping, yields recover and the benefits of the practice become clearer.

Over the long term, additional research on the effects of summerfallowing and alternatives to summerfallowing is essential to establish appropriate ways to deal with this problem. This is one of the topics that should be included in the research to provide more information on the maintenance of, and amendments to, Alberta agricultural soils, and the production research on crops such as nitrogen-fixing wheat or perennial wheat, as discussed in Section 5.4.1.

5.1.2 Solonetzic Soils

Solonetzic soils are those which have developed a sodic layer a short distance below the surface of the soil. This horizon is impervious to the penetration of moisture or plant roots, so that plant growth is restricted to the narrow layer of soil above the hardpan. This means that if moisture arrives at regular intervals, plant growth and yield are acceptable. However, since there is so little reserve soil moisture in the narrow band of permeable soil, solonetzic soils alternate between being waterlogged and droughty and this characteristic frequently results in a low soil pH, or an acidic soil.

It is estimated that some 10.6 million acres of Alberta soils are subject to solonetzic conditions. Their productivity is quite high where the solonetz layer is deep, while soils with topsoils of only a few inches have very little productive capacity. Solonetzic soils are found mostly within existing farms and are cultivated for grain and oilseeds, though where the topsoil layer is shallow they are kept in pasture.

For improving the productivity of these soils, deep plowing has been very effective in some cases. However, there are two major drawbacks:

1) It is not universally effective; in fact, in some instances deep plowing has created worse conditions than those existing before the operation. Deep plowing should only be undertaken after a full analysis of the problem by a soil scientist.

2) Deep plowing is expensive. Special equipment and very powerful tractors are required and the cost per acre is substantial.

The known high costs of deep plowing and the risk that the treatment will not be effective have prevented the widespread adoption of this technique. If deep plowing is to be expanded the following elements would be required:

1) a professional team that would provide the analysis necessary to identify that deep plowing could be successful;

2) assistance with the cost of the one-time program;

3) an insurance program to protect the farmer from the risk of failure if, in spite of good management, the treatment worsens the productivity of the soil;

4) this risk includes the possibility that deep plowing might increase discharge and salinization elsewhere; that is, that deep plowing could transform the solonetzic soil into a recharge area.

McGill (1982) estimated that up to 1 million hectares (2.4 million acres) of solonetzic soil could benefit from deep plowing, with improved crop yields of from 10 to 100 percent depending on the site. However, as mentioned, deep plowing is a costly operation and the actual extent of development should be subjected to the guidelines outlined for assessment and priorization of expansion and intensification programs (discussed in Section 5.3).

5.1.3 Acidic Soils and Liming

The severity of acidification is measured by the pH of the soil. The following estimates have been made of the severity of acidification in Alberta in 1981.

Table 44. Extent of acidic soils

	Severely Acidic (pH under 5.5)	Acidic (pH 5.6 to 6.0)	Potentially Acidic (pH 6.1 to 6.5)
Alberta (excluding Peace River Region)	230,000 hectares 568,000 acres	1,166,000 hectares 2,880,000 acres	2,276,000 hectares 5,624,000 acres
Peace River Region (Alberta and BC)	98,000 hectares 242,000 acres	447,000 hectares 1,105,000 acres	602,000 hectares 1,488,000 acres

Source: Hoyt et al. 1981

The bulk of acidic soils in central Alberta are associated with solonetzic soils. In the Peace River region, the Grey Luvisolic soils formed under forest canopies are naturally acidic. When nitrogen fertilizer is applied to these soils at a rate of 22.4 kg/ha/year (20 lbs/ac/yr), it will depress pH by 0.5 units in 40 years (Hoyt et al. 1981).

The use of lime to neutralize acid soil is a fully proven practice and it can have a substantial impact on yields. A major problem — that of distance between provincial lime resources and the farms that require it — has been mitigated by the Provincial Lime Transportation Assistance Program. Because little lime has been used in the past and the need for lime amendments to certain soils in the Prairies is not well known, it will take time before farmers are fully aware of the need for liming and utilize it to the extent necessary. The provincial program provides support to enable a lime production and distribution system to develop.

5.1.4 Drainage

The Panel received a brief outlining the extent of good agricultural land in sloughs and wetlands; this was estimated to be 157 acres out of every section of CLI Class 1 to 3 land in east-central Alberta (213). Another participant thought this estimate was too large (248), but agreed that the area involved is substantial.

Support for the drainage of sloughs and wetlands as a means of expanding the agricultural land base came from the presenters of briefs 85, 86, 93, 122, 147, 152, 167, 170, 177, and 213. However, others objected to the drainage of wetlands because of impact on the environment, recreation, wildlife habitat, groundwater quality and quantity, cost, or for aesthetic reasons, or warned of problems that could be associated with poorly planned drainage programs (33, 64, 92, 136, 148, 151, 181, 192, 210, 248).

In addition, some farmers and local councillors gave their views as to why drainage was not being developed to the extent possible (85, 86, 88, 93, 120, 148, 253). They frequently supported the concept of drainage but had encountered difficulties in implementing drainage schemes under current conditions. A Peace River councillor commented that when one drainage problem was solved, another was often created (253). He noted that the drainage of farmland led to problems with road and highway drainage and frequently to gullying and erosion. Another presenter pointed out other difficulties that arise when a drainage grid based on section roads is imposed on the natural topography and drainage patterns (122). Frequently grid roads travel along the high ground at the periphery of a section and attempting to drain water from the fields to them is futile. In the case of expansion into northern lands, much of this problem could be resolved if roads and their drainage ditches followed the natural topography and drainage basins, rather than the cadastral surveys.

However, the physical problems of drainage were mentioned less frequently than problems with current financial and administrative structures. One individual indicated that the county council in his area was advised by legal authorities to stay away from water issues including drainage, that they are too complex and it is hard to keep everyone happy (88).

A number of people pointed out the difficulty of achieving the necessary 100 percent agreement between farmers who want to drain their land and neighboring property owners who would have to provide the right-of-way or easements through which the drainage would flow (86, 93, 120). One presenter suggested that expropriation might be a solution in instances where only one property owner blocked a scheme (86); another suggested that having approval of only 75 percent of the affected property owners for drainage schemes might be appropriate (93).

Drainage districts, which have many of the characteristics and powers of municipalities for drainage purposes (election of officers, power to levy fees, powers of expropriation and construction), would seem to offer an effective solution to these problems. However, it was pointed out that no new drainage districts have been formed for 15 years and that the municipalities have all the powers necessary for undertaking drainage schemes.

The Panel believes that its recommendation for the establishment of "Soil Reclamation Districts" whereby two-thirds of the landowners within defined boundaries may determine the remedies necessary to arrest soil degradation and/or reclaim lands presently subject to degradation, could also be used for drainage purposes (see Section 3.3.6). In addition, if the Planning Act and Regulations were amended, as recommended, to provide for the implementation of rural replotting schemes, it would be possible to organize drainage and associated road systems more effectively (see Section 3.1.5).

Many types of expansion and intensification were suggested to the Panel as appropriate ways to expand or increase the productivity of the agricultural land base. This section has considered ways in which land can be improved in order to increase production, and the next section looks at approaches to intensifying land use. The Panel's major recommendation on maximizing the agricultural land base is found in Section 5.3.

5.2 Intensification

The full utilization of the existing agricultural land base is of course an important consideration in maximizing agricultural productivity. In addition to land improvements, full utilization involves intensification, a term often used to describe the improvement of land use from a productivity standpoint. This term has sometimes been interpreted to mean an improvement in production, rather than productivity, possibly at the expense of the quality of the land resource — in other words, exploitation. However, intensification should be defined as "constituting or relating to a method designed to increase productivity by the expenditure of more capital and labor rather than by increase in scope" (*Webster's New Collegiate Dictionary* 1979), with the additional stipulation that soil quality not be degraded. Support for some form of intensified farmland use was expressed by many hearing participants (12, 14, 16, 28, 39, 40, 47, 61, 70, 74, 81, 85, 101, 111, 130, 136, 172, 181, 182, 193, 201, 221, 222, 224, 231, 237, 238, 241, 248, 249, 254, 256, 260), although it was noted that, if improperly planned, intensification of agricultural land use can create land use conflicts in some circumstances (such as the location of feedlots near country residences or clearing of public lands with recreational value).

During the past 80 years, Prairie producers have increased their productivity many times over, and indications are that this trend can continue. As in the past, however, future productivity increases will only result from changing farm practices, improved management techniques, better equipment, and more investment. There are many mechanisms whereby productivity can be improved without reducing the long-term productive capacity of the soil; indeed, soil quality can be improved while productivity is increased. Intensification can reduce the pressure for expansion of the agricultural land base by meeting increasing demand for agricultural produce using the same, or even less land than before. This section will consider several of the most significant of these approaches, and point out some avenues for continued success.

There are many ways that agricultural land, both improved and unimproved, can be used which both suit the land resource capability and generate an income for the producer. Some of the intensive land uses which are alternatives to traditional dryland tillage include livestock or confinement facilities, greenhouses, market gardens, and irrigation.

5.2.1 Intensive Livestock Operations

Many of the hearing participants who discussed intensive livestock operations expressed concern about present or potential conflicts between these operations and country residences. Several participants thought that intensive livestock operations should not be limited by the demand for new country residential properties (30, 55, 238, 256) and it was pointed out that there are regulations prohibiting feedlots from moving into a rural residential area, but not vice-versa (94, 157, 238). The situation in the County of Lacombe was described as already having reached the point where future development of intensive livestock operations may be restricted due to residential encroachment (182, 197).

There is no doubt that there are certain conflicts between these two groups of rural land users, and as one presenter explained, the conflict is not limited to farmers versus non-farmers. It was suggested that disputes are just as frequent between farmers and feedlot operators as between non-farm country residents and feedlot managers (192). There are some positive signs that this sort of conflict may begin to diminish, however, as new technologies such as odor-limiting confinement operations and improved waste management practices are increasingly adopted.

As described in Section 2.5.1 of this report, the trend is for slower expansion of the livestock industry in Alberta. Unfortunately, this is largely due to factors outside the jurisdiction of the Province and beyond normal market forces. Federal programs as well as those of other provinces have worked against the livestock industry in Alberta.

Feedlots will likely expand in terms of fed animals only at the rate of population expansion in western Canada. Estimates of the population growth rate made during the oil and gas boom of a few years ago ranged all the way up to 3.5 percent per year. However, over the period April 1, 1983 to April 1, 1984, population in Alberta rose only slightly. In fact, over the last two quarters of 1983 and the first quarter of 1984, population actually declined in the province. The slow rate of growth in population can have serious effects, especially for the farmers who rely on livestock for a significant portion of their income. Cattle and calf receipts have dropped from 41.8 percent of total farm cash receipts in 1979 to 30.7 percent in 1981, 32.4 percent in 1982, and 29.6 percent in 1983 (Alberta Agriculture Annual b [1980, 1982, 1983]).

However, since large custom feedlot finishing is likely to become more common in the future there is potential for conflicts between intensive agriculture and residential development. The Panel has developed a recommendation designed to address this problem (see Section 3.1.1).

One study found that there were advantages to the larger feedlots compared with small-scale mixed farm feedlots (Smith 1981). The trend is towards larger and larger feedlots, right across North America. If this trend continues, there may be fewer, but more intense, land use conflicts involving feedlots in the future.

5.2.2 Greenhouses and Market Gardens

Both greenhouses and market gardens produce large amounts of non-agricultural products such as ornamental flowers and shrubs. Often the production of these items is more profitable than food production and they may be grown in conjunction with the agricultural produce to provide an even cash flow, and sometimes, to keep the operation in the black.

Factors affecting greenhouse production were specifically discussed in several briefs during the hearings (34, 66, 124, 227, 231, 247, 250, 260, 261, 262) and others mentioned greenhouses in passing (56, 61, 70, 94, 125, 200, 210, 224).

As of 1981, the Alberta greenhouse industry had annual sales of about $25 million and employed 1,000 to 1,200 people (66) on only 112 acres. This amounts to average gross receipts per acre of about $223,000. These figures include a large quantity of potted plants, cut flowers, and other ornamental plants of a non-food nature. Only about 25 acres of vegetables are grown, largely because the return on investment is lower for these products. (Greenhouse Industry Task Force 1983). One presenter told the Panel that one acre of tomatoes at Nova's greenhouse near Empress generated an annual revenue of about $160,000 (247). Bedding plants of a food-producing variety could also be included in greenhouse food production totals.

The potential for expansion is best illustrated by the fact that only 2.6 percent of all tomatoes consumed in the province are produced in greenhouses or the fields of Alberta. This is up from a tiny 1.5 percent in 1977 (Bishop et al. 1981). The markets for lettuce and greenhouse cucumbers may also experience substantial expansion if consumer tastes adapt to the greenhouse varieties through advertising, year-round availability, and price advantages during the off season for imports.

There are six basic problems with the greenhouse industry in Alberta, and some of these were addressed by hearing participants:

1) rising fuel costs which make up a substantial portion of the total greenhouse production costs (66, 124, 227, 262), although it was suggested that waste heat from suitable industrial activities (such as compressor stations or thermal generation plants) could help overcome this difficulty (56, 94, 125, 261).

2) a municipal tax structure which is believed to be discriminatory to certain greenhouse operations when they have become part of an urban center (66, 261);

3) certain federal taxes which are said to be inconsistent with the situation facing the greenhouse industry (federal sales taxes and duties on imported energy-saving devices which are not available from Canadian sources, and capital cost deduction rates for energy-conserving building improvements) (66);

4) the need for an improved and better integrated marketing system for greenhouse produce throughout the year;

5) the lack of a reliable and affordable transportation system within the province for perishable and fragile products;

6) the need for a labor force capable of providing seasonal workers at a reasonable wage and skilled workers for year-round duties (66, 247).

A Greenhouse Industry Task Force was appointed by the Minister of Agriculture in October of 1982, and their report became available in January of 1983, prior to the deliberations of this Panel (Greenhouse Industry Task Force 1983).

Among other things, the Task Force recommended:

- There should be some relief with regard to the federal taxes on natural gas for primary agricultural production in greenhouses.

- The provincial government should encourage the federal government to remove federal sales tax and duties on equipment not specifically available in Canada (for example, non-porous polyethylene, which causes condensation problems, is not a substitute for insulating curtains made for the purpose) which is used for energy conservation by the greenhouse industry and should further encourage the federal government to allow a tax deduction rate above the 5 percent per year now permitted for energy conservation equipment and modifications to building structures.

- The problems with marketing greenhouse produce must be addressed by the producers with the co-operation of the provincial government, but without direct interference in the market by government. The Department of Agriculture should continue to support the Alberta Greenhouse Growers' Association (AGGA) and the ''Better Buy Alberta'' program should be continued as well as the matching grants for advertising and promotion to Flowers Canada (Alberta Region).

If the above problems can be ironed out, greenhouse industry investors may develop the confidence to expand production to the point where an industry-wide ''critical mass'' may be reached such that transportation, storage, and labor shortages may no longer be impediments. (In fact, a recent publication regarding the industry in Alberta indicates that the former labor problem is no more, very likely due to the general economic climate [Chaudhary 1984]).

Much has been made of the potential use of waste heat from gas compressor stations, gas plants, and thermal electrical generating plants. There are already greenhouses in Alberta that were constructed to take advantage of waste heat from these industries, and many other industries generate sufficient excess and unused heat to significantly expand the greenhouse acreage in the province. The Task Force and many of the hearing participants recommended that more research should be done to further explore the use of waste heat for food production.

The Panel does not believe that greenhouse production can be relied on as a means of expanding Alberta's agricultural land base since, whether utilizing primary energy (such as natural gas) or waste energy, the energy sources are non-renewable and will become unavailable when they will be most required. However, because the greenhouse industry is an important one and should be treated like any other sector of the agricultural industry, the Panel recommends ''that greenhouse buildings and land be assessed as agricultural for municipal tax purposes.''

At present greenhouses located in rural municipalities are assessed as agricultural land. But if located in an urban municipality, they are not only assessed for land and buildings, but may be subject to a commercial mill rate and business tax. Quite often a greenhouse does not locate within an urban boundary by choice but rather as a result of annexation.

This type of assessment and tax treatment is a significant disincentive to the proper growth of the greenhouse industry. Since greenhouses require a large labor force, it is often desirable that they locate within urban boundaries, often on a site served by public transportation or with easy access for a labor force. Agricultural exemptions should apply within a city even if the parcel is less than 20 acres.

A number of participants in the hearings commented on various aspects of market gardens. Market gardens have a long but intermittent history in Alberta. Prior to the emergence of the marketing technique of the supermarket in the 1930s and '40s, market gardens provided a substantial portion of the vegetables required by city residents. It must be remembered that there were then relatively few city residents in the province, and many, if not most, had gardens. When large supermarket-type food stores became the standard, mass marketing was needed both from the standpoint of the retailer and the supplier. The large stores had to have a reliable year-round supply of vegetables, preferably fresh, and this led to the development of the large-scale suppliers found in the southern USA. At the time the technology was not available to store vegetables for long periods and still maintain fresh qualities, such as for carrots and potatoes. Market gardens did not recover from the supermarket usurpation of the supply of fresh vegetables until quite recently (Westervelt 1978).

Part of the reason for the return of market gardens is the phenomenal growth of farmer's markets throughout the province. In 1973 there were only four farmer's markets, by 1975 there were 40, rising to 85 in 1981 (Westervelt 1978; Farmer's Market Committee 1981). Total production tripled during these same eight years on about 1,310 acres. Farmer's markets have enabled market gardeners to short-circuit the supermarkets' monopoly on the supply of fresh vegetables, but only to a degree. Farmer's markets often operate only in the summer, and market gardeners do not have an affordable infrastructure for storing produce during the fall and winter. Thus they cannot avoid the problems of everyone's vegetables coming on the market at once (thereby reducing prices), and the problem of inconsistent supply which over winter loses potential customers who must then be won back each summer.

Not much research has been devoted to market gardens or farmer's markets in Alberta. One study found that 86 percent of producers selling products at a farmer's market used less than eight acres of land for vegetable production in 1977; more than 30 percent of such producers also travelled over 20 miles to sell their produce (Westervelt 1978). These statistics indicate that most market gardeners were small operators, but many took their sales seriously enough to truck their produce a substantial distance to market.

The Panel heard from many presenters who suggested that smaller parcels could be used for intensive agriculture, particularly market gardening (8, 12, 70, 74, 81, 85, 101, 136, 181, 221, 222, 231, 233, 249, 260), with nearly half of these appearing in Edmonton. Other presentations mentioned the Edmonton annexation situation in a negative light, at least partially due to the projected losses of prime agricultural lands, which are often used by market gardeners (30, 55, 70, 72, 83, 111, 125, 224, 231, 237, 249, 257). Of those which addressed the issue, the great majority of presentations to the hearings were unfavorable to the Edmonton annexation. However, at this point the Edmonton annexation must be dealt with in the context of preserving as much prime agricultural land for agricultural purposes as possible. The Panel believes that the recommendation dealing with assessment of annexed land in Section 3.1.1 addresses this concern and, if adopted, would encourage annexed agricultural lands to remain in production for as long as possible.

5.2.3 Irrigation

Irrigation in Alberta actually began before provincial status was received. Water for Alberta's first irrigation scheme was diverted from Fish Creek, now at the southern edge of the city of Calgary, in 1897, with further development occurring south and east of Calgary (Alberta Agriculture 1982). Early projects were privately developed and funded, but in 1915 the provincial government enacted the Irrigation Districts Act which set the stage for the "district" or co-operative phase of irrigation development. This permitted the farmers of an area to organize to raise funds to construct an irrigation project, and nine Irrigation Districts were formed as a result.

The federal government became involved in 1935 when the Prairie Farm Rehabilitation Administration (PFRA) was organized to provide engineering and financial assistance with water development projects on the Prairies, and this initiated a new phase of irrigation development. The provincial government shared some of the costs for these projects, and in 1973 an agreement was reached between Canada and Alberta in which the Province assumed operation of all on-stream diversion works operated up to that time by Canada. "Subsequently, Alberta established a policy of assuming basic responsibility for water supplies to all users, including operation of on-stream diversion works and major reservoirs" (Alberta Agriculture 1982:2).

A cost-sharing mechanism was put into place in the 1970s, with 86 percent of the capital and rehabilitation costs of the Irrigation Districts being paid by the provincial government (Alberta Agriculture) and 14 percent coming from the Irrigation Districts. The Province picks up the total capital, maintenance, and operational costs of irrigation headworks through the Department of the Environment.

The 86:14 cost-sharing formula was reviewed in 1984 by the government, and the decision was made to retain this formula. The new five-year mandate approved for the irrigation rehabilitation and expansion programs is funded by Alberta Agriculture and amounts to $150 million over the course of the next five years (Fjordbotten 1984).

Irrigation agriculture makes a significant contribution to agricultural production in Alberta; although only 4 percent of the land suitable for cultivation in the province is presently irrigated, produce from this land accounts for 20 to 25 percent of the value of agricultural products in Alberta (41). In 1983, about 4,200 farms used irrigation water on approximately 969,000 acres; the bulk of this occurred in the 13 Irrigation Districts located in southern Alberta (Alberta Agriculture 1984). These Districts have over 1.1 million acres assessed as irrigable. The provincial government has indicated that the goal is to increase the irrigated acreage in Alberta to 1.5 million acres by 1995 (Fjordbotten 1984). Cereal grains and hay continue to be the most important crops grown under irrigation and in 1983 accounted for over 76 percent of the irrigated acreage (Alberta Agriculture 1984). Other crops include sugar beets, oilseeds, and various vegetables such as potatoes, sweet corn, and peas.

Not surprisingly, many of the public hearing comments concerning irrigation were made in the southern part of the province where irrigation is most common. Hearing participants, especially from the Lethbridge and Medicine Hat areas, stressed the economic contribution that irrigation makes to the local communities and the fact that irrigated land is more productive than dryland (39, 41, 43, 63, 219). Although irrigation allows a greater variety of crops to be grown (61), present production is dominated by cereals and forage, with much of the forage being used locally to feed livestock (41, 42, 43, 219).

Some participants suggested that expansion of irrigation and development of new crop varieties and markets could compensate for the loss of agricultural land in other parts of the province (41, 43, 64), and it was also suggested that protection of presently irrigated lands should be ensured so that the high investment by taxpayers is not lost (42). However, others argued that in fact irrigation is not the answer to expansion of the land base (72, 228); it was pointed out that the soils most suited for irrigation are already in Irrigation Districts (72, 228), and that water supplies are too limited for further expansion (72). Furthermore, since the costs associated with expansion would be largely borne by the taxpayer (44, 188, 214, 255), it was suggested that additional public funding of irrigation projects should be carefully scrutinized (59, 71, 188), that the government should assess irrigation programs with particular consideration of costs and markets (5), and that consideration should be given to increasing the share paid by water users (210, 225). Marketing can be a problem for irrigated products (41, 63, 210, 219), and one person attributed this to general overproduction in the agriculture sector (43), while another suggested that although production for specialty crops could be increased, processing facilities are inadequate (37).

The Panel also heard representatives from other parts of Alberta express interest in seeing irrigation projects for their areas. It was suggested that irrigation should be considered in areas of intensive agriculture, such as the market gardens around Edmonton (249). Some areas of bottomland near Peace River are said to be suitable for irrigation (251), and in Improvement Districts 19 and 20 irrigation might be appropriate to ease problems with uncertain water supplies (148). Several people believed areas even further north, near Fort Vermilion, have potential for improved crop production through the use of irrigation (2, 5, 230). One of the major concerns here is the timing of moisture rather than the overall amount (2, 229), and it was suggested that research be conducted into the feasibility of irrigation in the north (5, 8, 229), particularly to enhance forage production.

Other aspects of irrigation received comments from hearing participants. One presenter discussed in some technical detail a spray irrigation project using municipal sewage in Cranbrook, BC (27). This project was considered to be a success, and the possibility of a similar system for the city of Calgary was presented to the Panel (28). It was estimated that capital and operating costs for using Calgary sewage effluent for irrigation may be less than building tertiary treatment facilities for the city (28). Using properly treated waste water in this way makes good use of both the water and the sewage nutrients it contains (239).

Use of waste water in another form was also discussed with reference to the Sheerness generating station. A pipeline from the cooling pond would increase agricultural production by allowing irrigation of thousands of acres in an area which is chronically short of water (57, 60, 211).

Proper water management was generally a matter of concern for those interested in irrigation, although there did not seem to be a consensus on the best approach. It was suggested that on-farm water management and water-use efficiencies could be improved through metering and modernizing the water application and delivery systems being used (39, 43, 61, 63, 219, 225, 248). Salinity problems on irrigated land appear to have resulted from a combination of susceptible soils (49), a leaky water distribution system (24, 64, 214), and improper application of water (214), and there was support for the continuation of rehabilitation projects (24, 39, 64, 219, 224, 225). Other approaches to improving water management were also mentioned; some of these focused on increasing the supply through construction and development of storage facilities (39, 41, 61), while others suggested that of land suffering from salinity or drainage problems should be reclaimed (41, 49).

It was pointed out that irrigation has made an aesthetic contribution to the southern Alberta prairies by creating wildlife habitat, and that the potential exists for integrating irrigation rehabilitation and wildlife planning to the benefit of both (51). However, the attractiveness of irrigated areas and the logistics of water application have created a situation which makes these areas popular choices for rural subdivision (61).

Intrusions by other developments, particularly those related to resource extraction, were also cited as creating problems for irrigation farmers. The Eastern Irrigation District (49) was particularly concerned about the impact of pipelines. The productive life of existing wells is being extended and there are difficulties associated with farming around these intrusions (49). The District's presentation also dealt with matters of financial compensation and liability, with the opinion that existing arrangements are not totally satisfactory. They, as well as others, expressed concerns about the concentration of development in their areas, and the fact that often there was not sufficient consideration of, or compensation for, the farmers' inconvenience and loss of production (49, 64, 69). Other linear developments were mentioned as causing problems for farmers (49, 64), but industry acknowledged these concerns and indicated that improvements have been made in the methods of siting such intrusions (211) and also in the approach to compensation (247).

Irrigation is only one of the uses for which water is required in traditionally water-short southern Alberta. However, it appears that the future of irrigation in Alberta is secure at least as far as water supply is concerned.

> *Limitations in irrigation water supply have been reduced by taking steps to ensure that the allocation of water for other uses will not interfere with the beneficial use and management of water for irrigation. Withholding water from allocation to other uses provides a protected supply, thus ensuring that water will be available to support increased irrigation in the future.* (Alberta Environment 1982:37)

Furthermore,

> *...the water rights presently allocated to Irrigation Districts are guaranteed, even though, in most cases, final licences have not been issued. In reserving surface water for future development within the South Saskatchewan River Basin, the first priority is given to designating water for irrigation use.* (Alberta Environment 1982:11-12)

However, despite its substantial benefits to the farmer and the local economy, irrigation is costly. With irrigation, as with other forms of maximizing and expanding the agricultural land base, it is necessary to appraise the available options and consider alternatives in order to make sound decisions that will provide the best returns for the investment. Essentially irrigation must be rated against other options for maximization such as drainage, clearing, deep plowing, and others, and those cases where the net returns are more favorable, with a smaller expenditure of public funds, should be supported on a basis of equal levels of government assistance. A major pitfall to be avoided is the development of an agricultural sector which can only compete on the international market place through a continuing infusion of government funds; one approach to avoiding such a pitfall is recommended in the following section.

5.3 Economics and the Further Maximization of Agricultural Land Use

It can clearly be seen from the preceding discussion of the various methods of maximizing the agricultural land base that many opportunities exist. In order to maximize agricultural development in the province, there must be a base of knowledge regarding which programs are worthy of what level of support in a comparative context. Expanding the acreage in agriculture and intensifying the use of land already in agriculture are both being examined in Alberta Agriculture's Land Base Study. Because a great deal of information will be forthcoming in the near future from this study, the Panel does not believe it is appropriate to comment in advance on precisely which form of expansion or intensification is most worthy of support. However, the Panel does have some recommendations as to how the results of the Land Base Study might be used in determining provincial support for future agricultural development.

The Panel recommends "that a research project be instituted to identify the full range of benefits and costs of various government incentive and subsidy programs on the sectors of the agricultural economy that they were intended to assist, as well as on other parts of agriculture and the larger economy." A full understanding of the economics of each type of potential expansion of agriculture must be acquired prior to funding, since at present no one knows for certain how government assistance programs affect agricultural operations of various sizes and types. For example, has the grazing reserve program helped small farmers more than large ranchers, or vice versa? It would be useful for improving the quality and impact of existing government programs to have a better understanding of the differential impact of these programs on a more detailed basis. The information gathered could improve the quality and delivery of future government programs.

Further to this end, the Panel recommends that "provincial programs of expansion and intensification should be assessed and priorized on the basis of the following guidelines." Prior to provincial funding, information should be obtained that provides valid estimates of the potential net return to the farmer as well as the total cost to government to provide assistance. This must include financial implications to all departments as well as the need for increased provincial grants to boards or municipalities. Assistance should be provided on a one-time basis either as capital assistance or "start up" money for a stated, limited period of time.

The impact of each proposed development on long-term soil quality and on the environment should be fully assessed. Remedial costs for damages to the environment or soil are often very high and these costs must be considered. No development should be supported unless it can be shown that it is capable of maintaining soil and environmental quality over the long term.

Once accurate information is obtained regarding net returns to the farmers involved and the total expenditure of provincial funds, the various alternative expansion and intensification projects should be ranked according to the highest overall payoff with the least expenditure. This type of priorization is necessary to ensure that the most appropriate development projects are supported and provincial expenditures are minimized and optimized.

Funding should be priorized according to the greatest returns to the farmer at the least provincial expenditure. If support were provided at a standard level on the basis of the net returns expected to be achieved per unit of expenditure, an equitable, non-biased, and non-distorting result with the highest paybacks to agriculture and to society as a whole would be achieved.

If a funding level in the ratio of 86:14 is accepted for a project, the total assistance provided should be no greater than six times the capitalized value of the increment in net productive value that can be ascribed to the expansion or intensification project.

Provincial support for expansion and intensification is warranted because of the direct and indirect positive impacts on the provincial economy from increased agricultural production. The amount of investment in each form of expansion and intensification should be guided by the potential returns from the investment and there should be no favoritism for one type of development over another, unless it is based on the potential for highest net farmer return for the least provincial expenditure.

All primary production projects that can be shown to provide a positive net return on a continuing basis, with no provincial contribution to operation and maintenance costs, are worthy of support. The priority for support and the amount of support should be guided by the ranking of expansion and intensification projects described above. As long as the investment is productive, it is warranted, and the costs would be able to be covered out of the enhanced production, employment, and income generated by the investment.

The various types of expansion and intensification being examined in Alberta Agriculture's Land Base Study include:

Woodland Conversion
Summerfallow Reduction
Prairie and Woodland Range Improvements
Irrigation Expansion
Range Conversion
Reclamation of Salinized Land
Expansion onto Green Area Lands
Drainage
Flood Control
Liming Acid Soils
Deep Plowing Solonetzic Soils

All of these forms of expansion or intensification have their place in the future of agriculture in Alberta. However, each of them should only be supported when it can be demonstrated that future long-term impacts on soil quality and the environment will be benign. The need, 25 years from now, for additional programs to reverse erosion, flash flooding, or additional salinization, traceable to inappropriate expansion or intensification, must be avoided. This is especially important considering the many options our diverse agricultural resources have provided us with. We in Alberta are most fortunate to have such a range of opportunities to select from and the means at hand to comparatively evaluate each; with that good fortune comes a responsibility to choose our future wisely.

5.4 Research and Technology Transfer

Agriculture is a significant component of the economies of Canada and Alberta. Agriculture's important contributions to the economy are possible because of Canadian ability to compete with other vendors of agricultural produce in the international marketplace, despite higher levels of subsidy offered to foreign farmers. Increases in productivity made possible by research have allowed Canadian agriculture to successfully compete in the marketplace. The role played by research can be appreciated by isolating some of the elements responsible for increased productivity over the past 50 or so years.

Most of the foreign exchange earned by Canadian agriculture comes from the sale of grain crops. Since the 1920s average crop yields in Alberta have increased, and are a major explanation for increases in crop production (Anderson 1983). About 22 percent of the historical yield increases during the last 50 years can be traced to genetic improvements in crops (Ibid.). Mechanical and chemical improvements have also played a large role in improving crop yields.

Greater use of and improvements to farm machinery have increased farmers' capacity to do work. Between 1946 and 1981, output per hour of labor in Canadian agriculture increased 428 percent (Ibid.). Mechanical improvements accounted for 20 percent of the improvement in production growth of crops in Alberta over the past 50 years (Ibid.). Concomitantly, there have been decreases in the number of people living on farms and in the number of farms, and increases in the average farm size.

Use of chemicals has complemented the genetic and mechanical improvements that have contributed to these increases in productivity. Improvements in chemicals, including herbicides and fertilizers, have accounted for about 40 percent of the improvement in production growth of crops in Alberta (Ibid.). The average growth rates of fertilizer use (14.6 percent annually from 1948 to 1975) were substantially greater than those of herbicides. The highest average annual growth rate of fertilizer use occurred from 1940 to 1949 (24.9 percent); the lowest rate was 5.2 percent between 1950 and 1959 (Ibid.).

Biological improvements in animal stock have also increased the productivity of Canadian agriculture. Between 1930 and 1981 the average calving rate for cattle increased from about 0.59 to over 0.80 calves per cow, an average annual rate of increase of 0.9 percent (Ibid.). Birth and weaning weights have been improved by crossing traditional beef breeds with 'exotic' breeds (Ibid.). Improvements in milk production per cow have been continuous from 1930 to 1981 (Ibid.). Improvements in poultry efficiency have resulted from better animal strains and better management. The rapid gains in poultry efficiency compared with other livestock have occurred because of the smaller space requirements and lower cost per animal, plus reduced time required to see the results of breeding experiments and other factors. Gains in production per bird are expected over at least the next decade (Ibid.).

Chapter 2 of this report provides a forecast of Canada's role in the international marketplace for agricultural produce to the year 2010. Canada's share of grain exports is expected to remain the same as at present, or in the case of wheat, to increase slightly. Projected increased volumes of export grains, however, mean that Canadian production will have to increase so that Canada can maintain its share of the market.

In Alberta, as in the rest of Canada, increasing production is possible only if we can overcome a number of trends which are conducive to yield declines, including:

1) decreasing soil productivity due to salinization and losses in organic matter;

2) alienation of good agricultural land and replacement by expansion onto lands of marginal quality;

3) real rising cost of energy at a time when, to achieve higher yields, applications of fertilizers should be increasing, not decreasing.

There are some signals that such trends may already be hurting agricultural productivity. For example, except for canola, rates of yield increases in Alberta for major grain and oilseed crops from 1971 to 1980 were less than the rates for the 1961 to 1970 decade (Ibid.). Crosson and Brubaker (1982) observed that actual yields of corn and wheat in the US were less than the weather-adjusted yields during the mid-1970s to 1980, and that the rate of increase in yields of corn and wheat was slower from 1972 onwards. Ridker and Watson (1980) also noted yields increasing at 2.30 percent per annum from 1950 to 1959 and only at 1.00 percent from 1970 to 1978. Measurements of total factor productivity (the ratio of farm output to combined inputs such as land, labor, and management) suggest that productivity is still increasing, but at a slower rate than in previous decades (Anderson 1983; Crosson and Brubaker 1982; Ridker and Watson 1980). Any decreases in Canadian agricultural productivity would seriously threaten the maintenance or increase of Canada's share of exports of agricultural produce and the attendant benefits provided to the Canadian economy. Clearly, research is required to overcome the elements conducive to yield declines.

However, that research will continue to keep Canadian agriculture competitive may be a false expectation unless some changes are made in the Canadian research institution. For example, Canada has made some important research contributions, but in general has depended heavily on imported knowledge for productivity gains (Anderson 1983; Hamilton 1980). Continuing to rely on imported technology to maintain Canada's competitive position in the export market would be unwise; it is probably unrealistic to expect the same gains in Canadian productivity as were achieved in the country of origin because the research applies to a different economy, climate, and set of conditions. Of further concern is that little research is being conducted that could result in major potential gains for agriculture in Alberta (Anderson 1983). More productivity research, as opposed to maintenance research, is required to ensure the competitive position of Canadian agriculture.

Concerns about the ability of Canadian farmers to meet anticipated export demands and remain competitive were evident during the public hearings in comments on research. Comments made to the Panel fell into three major subject areas: (1) topics requiring research, (2) funding of agricultural research, and (3) infrastructural impediments to technology transfer. These three areas are discussed in greater detail in the following sections.

5.4.1 Areas for Research

Biological Material — Although plant and animal breeding tends to require the longest period of time to achieve success, it seems to hold much of the promise for future gains in agricultural productivity (Anderson 1983). The development of new biological material for agricultural use was discussed extensively during the public hearings.

Several of the comments on plant research were appeals for the development of new varieties (8, 40, 59, 104, 136, 140, 147, 210, 214, 268). The presenters of briefs 136, 140, and 146 called for the development of earlier maturing varieties to increase production in areas where the growing season is short, especially in northern Alberta. Research into varieties most useful for southern Alberta, specifically specialty crops and irrigated crops such as barley and flax, was also recommended (40). Production could be enhanced with the development of nitrogen-fixing crops (24, 227) but the development of such crops will be a long time coming since comparatively little effort is being spent in this area (40). Other presenters suggested that research on perennial grains is required (20, 188).

Evidently most of the research on grass forages being conducted in Alberta emphasizes ecotype selection rather than the creation of new strains (228), even though there is adequate genetic potential in Alberta's native grasses for successful selection of superior forage-producing varieties (228). The potential for native grass research in land reclamation (228), conversion of unimproved land into rangeland (228), and improvement of already existing pastures are reasons for the development of an Institute for Grassland Research, which was recommended by one participant (228). In the meantime, large-scale utilization of Alberta native grass seed is hindered by the lack of commercial availability of high-quality seed, which is partly a function of complex Agriculture Canada licensing regulations (228). Also, progress in plant breeding might be significantly hindered by lack of sufficient numbers of university graduates to meet the requirements (Hamilton 1980).

There have been major advances in methods of harvesting, storing, and distributing grasses and forages through mechanization and ensilaging. However, the yield per acre has remained relatively static, certainly as compared with yield increases in the grains and oilseeds over the last two decades. The Panel believes that there is as much potential to increase yields of grasses and legumes as there is with grains and oilseeds, if research were to be focused on this neglected area. Native species, which are already adapted to Alberta conditions, should be examined for their potential contributions.

This research is of particular importance because of the contribution grasses and legumes can make to the conservation of the agricultural land base. An increase in yield would make them more attractive as crops. Therefore the Panel recommends that "more research into grass and forage production be carried out, particularly into methods of increasing yields per acre."

Comparatively few comments were made during the hearings on livestock improvements. The expansion of livestock production into northern Alberta offers potential productivity gains if a breed of cattle capable of withstanding insect attack and grazing under unimproved conditions could be found. Highland cattle, a breed which is claimed to be able to tolerate insects and rough pasture conditions, were suggested as candidates (112). That researchers will have to look primarily at existing agricultural stock for future productivity gains was implied in brief 242, where it was stated that virtually all of the remaining wild animal species have been tested and are not suitable for human handling. One presenter, however, is successfully raising musk oxen, and believed that other game animals (such as elk and moose) would do well on the marginal land in northern Alberta (105).

Few other comments on livestock research were offered during the hearings. More research was recommended into controlling manure odors and storage of wastes so that application can occur at the best time of the year (133), and the Canadian research community was criticized for failure to find ways of preserving hog semen for long periods of time, when other countries are reported to have succeeded in doing so (227).

Land and Water — The general topic of management of the land and water resources to maximize productivity was frequently mentioned during the hearings. Perhaps the land-related issue which received the most attention was soil degradation, specifically soil erosion, salinization, and acidification.

Several participants called for more research on soil conservation (72, 224, 245, 274). One presenter in particular was critical of Canadian support for soil conservation research relative to support in the US (72). A joint research venture of the three Prairie province governments and the federal government, with a goal of reversing soil degradation processes by the year 2000, was advocated (224). It should be noted that, to help rectify soil degradation, the budget for the Conservation and Development Branch of Alberta Agriculture was increased by $600,000 in fiscal 1984-85.

Despite the extensive erosion data that have been compiled in the US, research on soil erosion in various regions of Alberta is necessary because soil and climatic conditions differ greatly from those of the US. For example, research in the Peace River region of Alberta, where soil erosion is a major problem, has revealed soil losses that are small relative to American losses, but which are significant due to the thinness of the topsoils (220). Preliminary data from the Peace River region has indicated that rates of soil loss vary with season and crop cover (220), information that is useful in terms of controlling erosion. Research elsewhere in Alberta would probably yield equally useful data. Other reasons for conducting erosion research include:

1) the information base on rates of soil erosion in Alberta is poor (218);

2) erosion is a gradual process, so that a long time may elapse before its effects are apparent (218);

3) erosion losses can be easily masked by soil cultivation and fertilization (220).

It was recommended that the government and other organizations initiate studies to define the extent of soil erosion and determine techniques for controlling it (104).

The Panel feels that erosion is a serious problem in parts of Alberta and, in addition, that there are several types of problem soils for which technical and management information could increase production. With this in mind, the Panel recommends "that research be carried out to provide more information on the maintenance of and amendments to Alberta agricultural soils."

Alberta has a large block of agricultural land further north than any other significant agricultural area in North America. Erosion, particularly from water, is different here because of soil differences (for example, slow percolation) and snow runoff. Most soil erosion information is developed in the USA, and is therefore not totally applicable in Canada. Wetlands, wet land, and acidic and solodic soils are all found in Alberta and in some cases amendments could increase production significantly, but technical and management information is needed.

Soil salinity was discussed in several briefs (39, 45, 64, 65, 104, 178, 236). The spread of soil salinity is generally acknowledged to be most severe in parts of southern Alberta and research to determine the extent of saline soil was deemed important (64, 104). It was suggested that the first priority be to stop the increase in saline soil and that the second priority be to reclaim saline areas (45, 104). Funding for the drilling rigs doing research on salinity problems caused by recharge areas should be increased and made more secure (45). It was stated that sufficient research on salt-tolerant crops that can be used to reclaim salinized discharge areas has already been conducted (45), but research on economic ways to reduce the impact of soil salinity without threatening groundwater supplies was recommended (178).

Soil acidity was not identified as a major soil problem by hearing participants, and it was pointed out that evidence of reduced soil pH in Alberta soils 20 to 30 kilometers away from large sulphur sources is inconclusive (244). Environment Canada (244) recommended that a multidisciplinary research program be carried out to discover the potential susceptibilities to acidification of Alberta soils and to improve sulphur deposition measurement techniques.

The remaining comments on soil acidity related to reclamation of acid soils. Research on the adequacy of liming as a technique to mitigate the effects of acid deposition was recommended (244), as was more effort to discover new sources of lime for agricultural use (250). Nitrogen fertilizers have been identified as another source of soil acidification (40, 104, 225); therefore, the allocation of significant funds to investigate the use of natural fertilizers such as planted legumes was recommended in order to slow acidification by nitrogen fertilizers (225).

The other major aspect of reclamation research discussed during the hearings had to do with reclamation following resource extraction. One presenter described in general the research being conducted by industry and government at surface coal mines in Alberta (211). One of the major research efforts is to determine the depth of soil and subsoil necessary to reclaim sodic mine sites. It was suggested that there is some reluctance on the part of industry to expand reclamation research and that what is needed is an assessment of whether any real benefits in land productivity accrue from selective handling of subsoil materials (247). In contrast, other presenters said that reclamation research now underway should be continued (85), and that a definite need exists for expanded research on mine reclamation (30). Avoiding the need for reclamation by researching in situ coal gasification was recommended (94).

In response to the gaps in knowledge about the effects of industrial emissions and the effects of chemical or product spills on agricultural land, the Panel recommends "that a research fund be established to study soil reclamation and effects of industry on agriculture. This fund could be developed by contributions from industry, matched by government." While some research has been carried out, more and longer term testing is required, focused on agricultural land productivity.

The desirability of avoiding rather than correcting soil degradation problems was another major theme presented to the Panel. Soil degradation could be avoided by properly classifying soil capability and then using soil management techniques appropriate for the soil.

The Canada Land Inventory (CLI) system of soil classification was criticized during the hearings. The CLI system was described as outmoded because of varietal improvements in crops (18). In many cases, CLI maps give a false impression of accuracy by implying accuracy to the quarter section when the surveys from which the CLI maps were derived were conducted on a larger scale (80). The CLI system was judged to be unsuitable for planning purposes (21), yet soil inventory data is necessary for allocating land uses in Alberta (80, 146, 224) and for protecting the valuable food lands of the province (224). Therefore, it was recommended to the Panel that the Alberta government ensure that sufficient funds are available to complete a current research project which is bringing together and organizing existing soil inventory information (224). In addition, improvement of the soil survey data base should be a priority in already settled areas (80), and detailed soil and climate studies were recommended for the frontier areas of Alberta (146). The Panel is of the opinion that much of the detailed information needed on soils already exists, but it needs to be interpreted for the guidance of municipal and individual land use decision making. The Panel believes that the recommendation on agricultural land use classification (Section 3.3.6) addresses these concerns.

More comprehensive study of soils likely to be encountered in frontier areas was advocated during the hearings. Obtaining additional basic information on Luvisols followed by economic analysis to assess their potential for cultivation was advocated (246). One presenter noted the lack of practical research on peat soils, and recommended that research to determine if organic soils can be economically brought into production be started immediately (122). Slow development and research of peatlands was advocated (203) while another presenter offered the Panel a larger vision of development of peatlands, which could be used as more than just a farmland resource, for example as fuel (227).

Many soil degradation problems are the result of poor soil management techniques. There is an emerging consensus that the practice of summerfallowing has been responsible for many soil problems, so research into alternatives to summerfallowing should be encouraged (225). One management practice that appears to have some potential for use in Prairie agriculture is no-till farming. Currently much of the research on this method is being conducted by farmers themselves (47, 64). This research, however, is considered insufficient and no-till farming should receive more funding (47, 94); equipment for no-till farming was identified as an item needing special attention (47). Other conservation farming techniques, such as minimum tillage, continuous cropping, and crop rotations were recommended as items needing more research (64, 94) while grassland burning and subsequent aerial seeding in order to improve grazing capability were recommended for further research (16).

Compared to land-related issues, water-related issues as subjects for research received little attention. The two are related, however. For example, drainage of organic soils and wetlands could increase agricultural production by expanding the land base, and were proposed areas for research (122, 213, 227). Some of the soil salinity problems in southern Alberta are due to inadequately managed irrigation water, and recommendations for more research into irrigation water management were presented during the hearings (70, 225); it was considered that there is a general lack of money for irrigation research (41). Research on control of delivery waters is presently done through the Irrigation Districts (41). Irrigation research was also suggested for the northern Peace area (5, 8, 229). While the demand for irrigation water in the north Peace is unlikely to exceed supply, the same is not true in southern Alberta. Continued investigation into the concept of water transfer to southern Alberta was recommended (54), although it was stated that if water were to be procured in the Special Areas it would be used mainly to supplement the production of an adequate supply of feed for livestock (55). Another presenter suggested that dryland farming have a higher priority than irrigation, and that a go-slow attitude on developing irrigation be taken (59); as well, more research into flexible cropping patterns and snow management to prevent dryland salinity was suggested (64).

Chemicals — Although much of the historical increase in yields has been due to chemical applications, many hearing participants expressed concern about the use of chemicals. It is virtually impossible to determine all the hazards associated with agricultural chemicals (34), but more research was recommended in the general areas of: chemical safety and licensing (59, 92, 129, 133, 244, 262), monitoring of chemicals to assess long-term effects of biocides and fertilizers (70, 85, 133), and disposal of biocide containers (70, 85). Research on biological or mechanical means of pest control as alternatives to chemical pest control was advocated (126, 129, 200). Three specific areas were identified as desirable for more chemical research:

1) fertilizer use, especially yield responses of irrigated crops (40);
2) blackfly problems (7);
3) weed control in oilseed crops (104).

The Panel agrees that there is a lack of information on long-term impacts and recommends "that research should be carried out on an ongoing basis to study the long-term effects of agricultural chemicals on soils."

5.4.2 Funding of Agricultural Research

The use of public funds to support agricultural research was often called for during the hearings (40, 56, 104, 133, 200, 214, 243, 250, 254). Most of these briefs also advocated increasing private expenditures for research. One mechanism to obtain greater involvement by the private sector is check offs (56, 73, 104, 133); in this way farmers would shoulder a greater share of the costs for research programs but they would also be able to direct the research to their specific problems. Other presenters promoted the idea of a trust fund to pay for research (16, 38, 184, 228, 271), funded by special levies on land removed from agricultural production (16, 38, 184) or by endowments (228). Greater opportunity to introduce private sector funds into agricultural research would help to spur the research needs of the future.

The Panel recommends that "more funding for production research should be provided, and that there should be closer liaison between provincial and federal research institutions. Producers should be encouraged to contribute to research funding through a levy on sales of production."

Excellence in agricultural production is important. Production research such as the development of new varieties, crops and techniques is necessary for Alberta to maintain or improve its competitive position in world agriculture. There are some potentials, such as nitrogen-fixing wheat or perennial wheat, which could have significant effects on costs of production.

Estimates suggest that agricultural research investment has a return of between 30 and 40 percent per year. Producer involvement in the research programs by way of check offs can improve researcher-producer communication with benefit to both.

Since our agriculture must compete on a world market, it should be supported by research institutions, facilities, and researchers of world class. There is also a potential spinoff since world-class research helps open markets for Alberta products, equipment, livestock, services, and consultants.

Long-term funding for research was suggested to be critical for real increases in productivity (55, 104, 109, 228, 246, 274). Comments on long-term research presented during the hearings applied to both specific projects (203, 228, 246) and to the general commitment of funds. On this latter point, some comments were made about the government of Alberta's Farming for the Future program. Funding for research from the program is well received, but increased and longer term commitment of funds is felt to be desirable (55, 76, 109, 256). Farming for the Future awarded almost $25 million in the first five years of its operation. The program has been given a new three-year mandate, with $5 million allocated for 1984-85 and funding for each additional year requiring annual approval by the Alberta Legislature. Clearly the Farming for the Future program has not been developed or conceived as a long-term agricultural research funding source. Long-term funding for agricultural research has been identified as a federal responsibility, one which has been subject to excessive fluctuation over the last two decades. It is, however, important for the federal government in particular not to withdraw its support for longer term agricultural research just because there is an alternative provincial source.

5.4.3 Impediments to Technology Transfer

Basic research is but one step (although a crucial one) in realizing productivity gains. After the basic research has been done, there are often lengthy delays before new technologies are adopted by the general farm population (Anderson 1983). Several items influence adoption rates (Anderson 1983), among them education, communicability, and promotion. Producer adoption of technology and inadequate extension/education were not perceived to be major obstacles to productivity growth by research scientists interviewed by Anderson.

Research can only yield results if the research results are put to use on the farm (147). Several people commented on the value of, or need for, farm extension services (9, 48, 53, 54, 70, 80, 85, 104, 133, 214, 250, 254, 268). One of the themes behind the hearing comments was a desire for more technical assistance at the farm level to give the farmer practical help in solving problems, in much the same way that the Soil Conservation Service is perceived to operate in the US. Alberta Agriculture's 1984-85 spending estimates suggest that a large share of the department's activities involve transferring the results of research to the farming community.

Recognition of the problem of information transfer as an obstacle to productivity gains, and the commitment of government to overcoming this obstacle, are indicated by two recent studies on information transfer which have been commissioned by Alberta Agriculture and Agriculture Canada (Alberta Agriculture 1983; Agriculture Canada 1984a).

Another significant theme presented during the hearings was the need for farmers to have agricultural research done in their own locale (268). This would help overcome the difficulties of applying the results of research conducted in one area to other areas. More research in northern and northeastern Alberta was recommended (7, 9, 101, 104, 139, 229, 246). The research being conducted at the major research stations is not directly applicable to the northeast region (104). The soils of Melfort, Saskatchewan were thought to be more akin to the St. Paul area than are the soils near Beaverlodge (101). Similarly, the research being conducted at Swift Current, Saskatchewan was thought to be more valuable to farmers in the Hanna area than the research being conducted at Lethbridge and Lacombe (56) and several presenters recommended that a research substation be established in the Hanna area (53, 54, 56, 57).

Notwithstanding the usefulness of research substations in these areas of Alberta, the capital costs to establish the stations probably would be high. Possible ways of avoiding these difficulties and still having local research done include the option of establishing farmer research associations (56, 104, 147), such as the Chinook Applied Research Association. Such organizations were discussed in briefs 56, 104, and 147, and it was stated that farmers should be willing to pay for such research (104). A somewhat different option would be to provide more grants for farmers to do their own research and publish their research results (76). On-farm research demonstrations are a welcome part of Farming for the Future. There is also room for expansion of on-farm demonstrations.

The Panel recognizes the need for research particular to each agricultural locale, and so recommends "that Agricultural Service Boards be encouraged to act as a practical research liaison within their jurisdiction in determining local research needs and in planning and managing projects." The local Agricultural Service Board knows its area and the people in it. By determining local research needs, and then initiating a project, the Service Board will serve an extension role as well as a research role.

CHAPTER 6

CONCLUSION

This investigation into maintaining and expanding the agricultural land base in Alberta has provided an opportunity to focus on issues which have considerable long-term significance for this province and its citizens. Although the majority of Albertans no longer live on the farm, the rural roots are there, often only one or two generations away. These ties were apparent during the public hearings as participants often expressed strong feelings in support of agriculture and the rural life style, and indeed for many people in Alberta, agriculture is as much a way of life as a livelihood.

The "grass-roots", or primary production, level of farming in Alberta is the visible aspect of the industry and the component with which everyone is familiar, whether through Sunday drives in the country, a farm holiday, or the first-hand experience of farm life. However, though primary production is the essential base of the agriculture sector, it is also the base of an economic sector which provides thousands of jobs and generates millions of dollars in export earnings. It is the significance of this aspect of the industry that few people outside agriculture recognize. In a province where petroleum-related issues often dominate the headlines, the contribution of agriculture to the provincial economy and to our standard of living tends to remain hidden. Many Albertans would be surprised to learn, for example, that in 1982 primary agriculture provided employment for 81,000 people compared to the 59,800 jobs in the oil, gas, and coal primary industries. In 1980 the food and beverage sector accounted for 20 percent of the employment in manufacturing (16,133 jobs) while petroleum, coal, and chemicals and chemical products accounted for 11.2 percent of total manufacturing employment (9,081 jobs).

Agriculture is clearly a driving force in the Alberta economy, and unlike the energy sector, is based on a potentially renewable resource which, with careful nurturing, could be available to grow crops forever. Furthermore, although agriculture is a major land user in Alberta, it is also compatible with many other uses which contribute to an improved quality of life for all citizens. Properly conducted in its own long-term interests, agriculture is capable of producing a visually and aesthetically pleasing landscape, enhanced soil quality, habitat for upland game birds, waterfowl, and certain types of wildlife; reducing wind and water erosion; and maintaining water quality and streamflow. The conservation of the agricultural land base and its management to achieve continued and enhanced returns on a long-term basis are fully compatible with achieving and maintaining a high-quality environment to be enjoyed by the people of Alberta in perpetuity. The key is to ensure that users of the land base realize that the multiple uses can be compatible and that there is adequate planning and co-operation to allow these to occur.

Alberta's agriculture has developed on the basis of commercial viability in world markets, and its future will depend on the ability to maintain a world-class competitive capability for food production. This can only be done if we maintain the present productive capability of the agricultural land base and expand on that base in the future, as opportunities in the marketplace arise. There will be a demand for Alberta's agricultural products in the future, and wise decisions made now will enable us to use our advantages most efficiently to supply these commodities at competitive prices. It is this desire to maintain a healthy and sustainable agricultural industry, responsive to the needs of 21st century society, that has prompted the Panel to make the recommendations in this report.

The Panel believes that protection of the agricultural land base in Alberta is justified in order to preserve an essential element of a world-class competitive industry which will become more rather than less important to the well-being of Albertans. To achieve the objective of conservation, maintenance, and enhancement of the agricultural land base, the Panel has recommended a balance of provincial and local responsibility for various aspects of this task. The Agricultural Resources Conservation Board would have responsibility, on behalf of the province, to provide an overall perspective on matters which affect the agricultural land base, while both the rural municipalities and the Agricultural Service Boards would have their duties and responsibilities expanded. The Panel believes that local authorities are the most appropriate agencies for dealing with local issues and concerns, but they need to be provided with the administrative tools and decision-making responsibility to undertake the job effectively. Problems and circumstances vary significantly around the province, and it makes sense to encourage the development of local and possibly unique solutions that are most suitable for the area affected.

Closely linked to this public responsibility for preservation of the agricultural land base is the need to ensure that the on-farm decisions of individual landowners are the best ones possible to maintain long-term productivity. Private ownership of land is a valued privilege in our country, and property rights are jealously guarded and defended, and rightly so. But individuals sometimes do not have the same responsibility or commitment to the future that society as a whole must have. There clearly are benefits from agriculture to society above and beyond those which accrue to individual farmers, but it is the individual who is being asked to take the risks and make the decisions which may have long-term effects on the land base. The responsibility for the maintenance of a high-quality agricultural land base ought not to rest solely with individual farmers, but should be shared by the whole of our society. The economic situation which many farmers find themselves in has forced them to cope as best they can in the short run, and often precludes long-range conservation programs which may take many years to show returns. The Panel heard this theme frequently during the public hearings and has made several recommendations in the area of soil conservation which it thinks will assist farmers and local Agricultural Service Boards in taking a pro-active, preventive approach to land management. Increased research in several related areas combined with a greater sensitivity to topography, climatic conditions, and soil type would avoid subsequent problems with erosion and other forms of soil degradation. The Panel does not believe that bribing farmers to practise conservation or to reclaim degraded soils is warranted. If conservation practices and reclamation make sense they should be attractive economically as an investment. Since society as a whole will benefit from the increased production and activity induced by this investment, government assistance is warranted in conservation, reclamation, intensification, and expansion. However, such investments should be market-directed to those practices and opportunities that will generate the greatest return for the least governmental assistance.

The opinion was often expressed during the public hearings that land is not merely a commodity to be bought and sold, that attitudes need to change so people recognize that land stewardship and responsible land management are required if the land resource is to be truly renewable. The Panel fully agrees with this and believes that in the long term, land management decisions that are environmentally sound will also prove to be economically sound.

At the same time, the Panel realizes that there are other demands on agricultural land, and that these needs must also be considered. But it makes sense to keep our best agricultural soils for producing crops, since the rewards to intensification and management are greatest on better land. Other activities that can just as easily use poorer soils should be encouraged to do so, and to accomplish this, the Panel has recommended the establishment of an Agricultural Productivity Compensation Fund to which a specific contribution would be made when land is removed from agricultural production.

There are many options for expanding the agricultural land base in Alberta, but expansion of agriculture onto poorer soils will not compensate for the loss of good soils either to other uses or as a result of degradation. Options for expansion include reclamation of degraded lands within the existing agricultural land base as well as numerous methods of intensification and land improvement. The Panel is of the opinion that all of these options should be comparatively evaluated before any public funding is provided, and only those which are cost-effective and environmentally benign should be supported. Northern expansion of the land base is included in this list of options, and should be restricted to the fringes of existing agricultural settlements until more is known about potential expansion areas.

Alberta has many advantages which should be realized and used effectively to maintain our position in the global agricultural community. There are problems in the agricultural industry but these are unique to neither the industry nor the province. To address some of these problems the Panel has considered specific issues and taken an integrated approach in their recommendations, in the belief that several smaller changes and adjustments within an already existing system are preferable to broad sweeping policies which may have unpredictable long-term consequences. Alberta has been able to compete with the world's most efficient agricultural producers in the past and we should be able to do so in the future. The Panel believes that the preservation and maintenance of our agricultural land base is crucial to the long-term viability of the agricultural industry, and if the recommendations in this report are adopted, major steps will have been taken to ensure that in the next century agriculture remains a healthy, sustainable, and essential industry in Alberta.

The Council wishes respectfully to place these recommendations and this report before you.

Environment Council of Alberta
Panel on Maintaining and Expanding
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APPENDICES

APPENDIX A. AGRICULTURAL LAND BASE PUBLICATIONS

These reports were prepared as background information for public hearings on maintaining and expanding the agricultural land base in Alberta. Copies may be obtained without charge from the Environment Council's Library.

	Technical Report	Summary Report
General Background		
Terms of Reference and Background Information		X
The Agricultural Land Base in Alberta	X	X
An Analysis of Legislation Affecting Agricultural Land in Alberta	X	
Addition of Land		
Irrigation Agriculture in Alberta	X	X
Agriculture and Public Land Management in Alberta		X
Loss of Land		
Urbanization of Agricultural Land	X	X
Rural Subdivision in the Edmonton, Battle River, Red Deer, and Calgary Regional Planning Commissions, 1977 to 1979	X	
The Impacts of Linear Developments, Resource Extraction, and Industry on the Agricultural Land Base	X	X
Multiple Use of Land		
Fisheries and Wildlife Resources and the Agricultural Land Base in Alberta	X	
Recreation on Agricultural Land in Alberta	X	X
Soil Quality		
Soil Fertility and Land Productivity in Alberta	X	X
Dryland Salinity in Alberta	X	
Other		
Factors Affecting Summerfallow Acreage in Alberta	X	X
Agricultural Land and Land Use Planning in Alberta: A Review of Planning Legislation and Practices	X	X
Options for Protecting Agricultural Land		X
Economics of Agriculture in Alberta: Selected Issues	X	X
Agriculture and the Environment	X	X
Greenhouse Production in Alberta		X
Agricultural Research and Productivity in Alberta	X	X
Agricultural Land Protection Mechanisms in Canada		X

APPENDIX B HEARING LOCATIONS AND PARTICIPANTS

Fort Vermilion July 28, 1983

1	Gordon Reid	Self
2	John Simpson	Self
3	Gary Scarfe	Self
4	Bob Gainer	High Level Chamber of Commerce and Fort Vermilion Board of Trade
5	Reg Scarfe	Self
6	Simon Nanooch (read in)	Little Red River Band
7	Bill Fedeyko	I.D. No. 23 Agricultural Development Committee
8	Gene Dextrase	I.D. No. 23 Agricultural Service Board
9	Henry Vos	Self
10	Bill Weegar	Self

Calgary October 12, 13, 14, 1983

11	A. Chris Dunkley	Self
12	Lucille Dougherty	Calgary Regional Planning Commission
13	Cam Sibbald	Self and R.R. Thompson
14	James Beck	Canadian Institute of Forestry, Rocky Mountain Section
15	James Lawrence	Canadian Petroleum Association
16	Wayne Heller	Alberta Cattle Commission
17	C. Redvers Perry	Self
18	Harvey Buckley	Self and group of ranchers
19	Ken Macmillan	South Sheep, North Sheep, Elbow, and Jumping Pound Stock Associations
20	Hilda Buckman Crook	Self
21	Shane Bateman	Self
22	Erik Butters	Self
23	R. Liddle	Members of St. David's United Church
24	Don Broughton	Public Advisory Committee to the Environment Council of Alberta, Non-Renewable Resources Study Group
25	Jenny Krabbe	Citizens for Public Justice
26	Bob Miller	City of Calgary
27	Ken Rattray	EPEC Consulting Western Ltd.
28	Bob Hawkesworth	Self
29	Harry Cambrin	Municipal District of Foothills No. 31
30	Stan Bell and G. Friesen	Unifarm
31	Gordon Barker	Calgary Co-op Association
32	Cliff Wallis	Alberta Wilderness Association
33	Dianne Pachal	Alberta Wilderness Association

34	Hazel Armstrong	Langevin Community Garden Project
35	S. Brodylo	Self
36	Gail Burton	Self and Ross Burton

Lethbridge October 18, 1983

37	Horst Fauser	Self
38	Stan Wilson	I.D. No. 6 Advisory Council
39	Elizabeth Hall	City of Lethbridge
40	Ross MacKenzie	Alberta Institute of Agrologists, Lethbridge Branch
41	David Hill	Alberta Irrigation Projects Association
42	Lynda Paterson	Oldman River Regional Planning Commission
43	Roy Jensen	Lethbridge Northern Irrigation District
44	Mike Cooper	Self
45	Bill Norris	Dryland Salinity Control Association
46	Katharine Russell	Self

Brooks October 20, 1983

47	Mike Toth and Wayne Arrison	Alberta Farmers Conservation in Crop Production Association
48	Dorothy Williams	Alberta Women's Institutes, District 5
49	Don Alberts	Eastern Irrigation District
50	Jim Hajash	Self
51	Kim Schmitt	Self

Hanna October 25, 1983

52	Lyall Curry	Self
53	Florence Storch	Alberta Women's Institutes, Dundee and Fireside Branches
54	Andrew Duff	Special Areas Advisory Council
55	Ronald Leonhardt	Unifarm, Region No. 11
56	Brian Heidecker	Self
57	Bill Doyle	Palliser Regional Planning Commission
58	Jim Johnson	Self
59	Doug Fawcett	Self
60	Gordon F. Kroon (read in)	Self

Medicine Hat October 27, 1983

61	James Muller	Southeast Alberta Regional Planning Commission
62	Reiny Lehr	Short Grass Ranches Limited

63	James Brown	St. Mary River Irrigation District
64	Will Van Roessel	Unifarm, District No. 133
65	Edwin Herrmann	I.D. No. 1 Agricultural Service Board and Advisory Council
66	Herman Wahl	Alberta Greenhouse Growers Association, Flowers Canada-Alberta, and Red Hat Co-op
67	Warren Brower	Self
68	Peter Armstrong	East-West Ranching Company
69	Olander Ost	Self

Olds November 1, 1983

70	Kathryn Habberfield	Alberta Women's Institutes
71	Holly Hallet	Self
72	Dr. John Toogood	Self
73	Alan MacPherson	Alberta Wheat Pool
74	Lynn Zwicky	Five students at the University of Calgary, Faculty of Environmental Design
75	Vivian Pharis	Alberta Wilderness Association
76	Dave Thomas	Bow North Surface Rights Association
77	Gary Leithead	Revelstock Concrete and Lumber Ltd.
78	David Scott	United Church of Canada, Alberta Conference
79	Ron Burgess	Olds/Didsbury Progressive Conservative Association
80	Bill Souster	Olds College
81	Dennis Hawthorne	Municipal District of Rocky View No. 44
82	Herman Dorin	Self

Camrose November 3, 1983

83	Becky Strilchuk	Round Hill-Dodds Agricultural Protection Society
84	R.H. Riddett	Battle River Regional Planning Commission
85	Martha Lindsay	Alberta Women's Institute, Ohaton Constituency
86	Ole Lovrod	Self
87	Martha Inions	Self
88	Larry Williams	Self
89	Andrew Cameron	Self
90	Harry Stauffer	Self
91	Rosemary Snider	Self
92	Georgina Nelson	Camrose and County Association for Children and Adults with Learning Disabilities
93	Lee Fenger	4-H Beef Club, Camrose
94	Walter NcNary	Unifarm, Camrose District Board
95	Bob Anderson	Self

St. Paul November 7, 1983

96	Stanley Rymut	Self
97	Andrew Melnyk	Self
98	Sid Pawlowski	Alberta Beekeepers Association
99	Alban Bugej	Elk Point Surface Rights Association
100	Ken Neilsen	Elk Point Surface Rights Association
101	Neil Cory	Self
102	Daniel Johns	Self
103	Don Stefaniuk	Self

Wainwright November 9, 1983

104	Nestor Rekimowich	Alberta Institute of Agrologists, Northeast Alberta Branch
105	Mary Burpee	Self and Clarence Burpee
106	Carl Bergerud	Unifarm, District No. 72 Council
107	Ernie Bouchard	Town of Wainwright
108	Rod Arthur, Clay Tondu, and Alan Spady	Highway 14 East Surface Rights Group
109	Doug Fawcett	Self
110	Garvin Simkin	Self

Evansburg November 15, 1983

111	Grahame Allen	Yellowhead Regional Planning Commission
112	E.W. Phillips	Self
113	Stan Munro	Self
114	Walter Koeberntck	Self
115	Victor Lauder	Self
116	Eric Karlzen	I.D. No. 14 Agricultural Development Committee
117	Andy Kremeniuk	I.D. No. 14 Agricultural Development Committee
118	Harry Tyrrell and Philip Hastings (read in)	Mewassin Rural Community Association
119	Eric Karlzen	Self
120	Willy Brenenstuhl	Self

Barrhead November 17, 1983

121	William McLean	Self
122	Charles Rypien	Athabasca Agricultural Development Committee
123	Terry Georz	Swan Hills Chamber of Commerce
124	Roy Steinbring	County of Barrhead Agricultural Service Board
125	Harvey Lehr	Fort Assiniboine Agricultural Development Committee

126	W. Seatter	Municipal District of Westlock No. 92
127	Dennis Nanninga	County of Barrhead Agricultural Development Committee
128	John Ablett	Town of Whitecourt
129	Ted Pitman	National Farmers Union
130	Daryl D'Amico	Blue Ridge Lumber (1981) Ltd.
131	Bob Diesel	Alberta Trappers' Central Association
132	Herbert Anderson	Barrhead Community Leisure Services Committee
133	Andy Wierenga	Christian Farmers' Federation of Alberta, Neerlandia Local
134	C.E. Anderson	Self
135	Tom Olson (read in)	I.D. No. 15 Agricultural Service Board

Peace River November 22, 1983

136	Burnice Bamping	MacKenzie Regional Planning Commission
137	Bob Udell	Canadian Institute of Forestry, Rocky Mountain Section
138	Peter Doll	National Farmers Union, District 2, Region 8
139	Norm Weiss	Northern Alberta Development Council
140	Bryon Adams and Clyde Norman	Canadian Forest Products Limited, Alberta Operations
141	Don L. McDougall	Self
142	Rudolph Lubeseder	High Prairie Agricultural Service Board (I.D. No. 17)
143	John Nicolet	Smoky River Fish and Game Association
144	D.C. Norheim	Peace Country Fish and Game Association
145	T.R. Sonntag (read in)	I.D. No. 22 Division 6 Council
146	R.E. Walter (read in)	Town of High Level

Grande Prairie November 24, 1983

147	Hugh Horner	Self
148	Jim Kincaid	I.D.s No. 19 and 20 Advisory Councils
149	Harry Howell	National Farmers Union, Local 807
150	William Janssen	South Peace Regional Planning Commission
151	Percy Hunkin	Alberta Fish and Game Association
152	Hartmann Nagle	Unifarm Region 1 Board
153	Elaine Dick	I.D. No. 19 Agricultural Development Committee
154	Terry Barr	Procter and Gamble Cellulose Ltd.
155	Charlie Pensen and Darryl Carter	Bear Lake Farm Rights Group
156	Harry Merrifield	Self
157	Victor Kimpe	Self
158	Wally Akers	Students Aware of Land and the Environment

159	Mary Henderson	Students Aware of Land and the Environment
160	Marianne Baden (for Alexa Gillespie)	Students Aware of Land and the Environment
161	Mike Flett	Students Aware of Land and the Environment
162	Darryl Hurlock	Students Aware of Land and the Environment
163	Chris Anderson	Canadian Forest Products Limited, Alberta Operations
164	Brian Horejsi	Self
165	William Anderson	Grande Prairie Economic Development Office
166	Donna Maclin	National Farmers Union
167	Allen Watson (read in)	Self

Vegreville November 30, 1983

168	Elmer O. Wolters	Northeast Alberta Surface Rights Protective Association
169	George Gow	Heavy Crude Surface Rights Council
170	George Nestman	County of Minburn Agricultural Development Committee
171	John H. Austin	Self
172	Kae Cockle	Alberta Women's Institutes, Vermilion/Alexandria Constituency
173	Andrew and Kathleen Grech	Self
174	Rev. Elias Wipf	Hutterian Brethern of Drumheller
175	Andrew Melnyk	Self
176	David Holdsworth	Self
177	Peter Hrabec	County of Beaver Agricultural Development Committee

Red Deer December 1, 2, 1983

178	Roy McBride	Self
179	Pat Brock	Consumers' Association of Canada, Alberta Provincial Association
180	Alan Kidd	Alberta Institute of Agrologists, Calgary Branch
181	Elmer Kure	Alberta Fish and Game Association
182	Bob McGhee	Red Deer Regional Planning Commission
183	Boyd Petersen	Unifarm, Region No. 10 and Women of Unifarm, Region No. 10
184	George Friesen	Self
185	Martha Kostuch	Self
186	Jim Hainsworth	Self
187	Paul Meyette	Canadian Institute of Planners, Alberta Association
188	R.H. Carlyle	Self
189	Alex Rose	Self
190	Doreen MacDonald	Self

191	Fred Mueller	F.E.M. Farms Limited and Alberta Cattle Feeders
192	Lorne McLeod	County of Red Deer No. 23
193	Don Low	Preserve Agricultural Land (PAL)
194	Martha Kostuch	Rocky Mountain House Agricultural Society
195	A.E. Wigmore	County of Lacombe No. 14
196	Graham Sharp	4-H Club, Lacombe
197	Ray Niemela	Lacombe Agricultural Development Committee
198	Donald Carlyle	Self
199	Rev. Hugh Walker	United Church of Canada, Red Deer Presbytery
200	Christina Wager	United Church of Canada, Alberta Conference, Church in Society Division
201	Neil Wagstaff	Buffalo Lake Regional Resources Project
202	Albert Stolte	Self
203	David Stelfox	Self
204	Fred Schutz	Self
205	Dorothy Broadbent	Alberta Wilderness Association

Edmonton December 5, 6, 7, 13, 14, 15, 1983

206	Brian McCutcheon	Alberta Pork Producers Association
207	Dick Marshall	Coal Association of Canada
208	Don Price	Urban Development Institute of Alberta
209	Darrell Toma	Group of Alberta Resource Economists
210	Tony Ferguson	Alberta Fish and Game Association
211	Gavin Hanslip	Electric Utility Planning Council
212	Lorne Brace (question only)	Canadian Institute of Forestry, Rocky Mountain House Section
213	M. Apedaile and E. Rapp	Self
214	Noel McNaughton	Self
215	John Cartwright and Clay Chattaway	Western Stock Growers' Association
216	Stan Whitson	Self
217	Peter Korolub	Self and a number of farmers
218	Graeme Greenlee	Self
219	Jack Brewin	Self
220	David Chanasyk	Self
221	A. Klassen	Self
222	John Beatty	Beatty Engineering Limited
223	Alderman Craig Reid	Alberta Urban Municipalities Association
224	John Kolkman and Lambert Tuininga	Christian Farmers Federation of Alberta, Provincial Board of Directors
225	Grant Notley	Alberta New Democratic Party
226	Brian MacDonald	Alberta Forest Products Association
227	Ernie R. Goodwin	Self
228	J. Weijer	Self
229	Bill Fedeyko and Tom Reid	I.D. No. 23 Agricultural Development Committee and Agricultural Service Board

230	Reg Scarfe (read by B. Fedeyko)	Self
231	Jim Visser	TOPSOIL (To Please Save Our Irreplaceable Land), North East Edmonton Association
232	Jim Holub	Self
233	Philip Ellwood	HUDAC, Alberta Council
234	Ken Allred	Alberta Land Surveyors' Association
235	Paul Woodard	Public Advisory Committee to the Environment Council of Alberta, Renewable Resources Study Group
236	Bill Norris	Dryland Salinity Control Association
237	Michael Manett	City of Edmonton
238	Ross Quinn, Norm Giffen, Wes Shennon, and Brian Kwasny	Edmonton Metropolitan Regional Planning Commission
239	Max Bahnsen	EPEC Consulting Western Ltd.
240	Cecil Goutbeck and Wayne Groot	Christian Farmers Federation of Alberta, Edmonton Local
241	John Hilliard	City of Leduc
242	Val Geist	Self
243	Olga Cylurik	Edmonton Local Council of Women
244	Robert Lane	Environment Canada
245	Don Hoover	Alberta Institute of Agrologists
246	Prof. Jim A. Robertson	Self
247	Philip Mason and Robert Buchanan	Nova, An Alberta Corporation
248	Dr. Arleigh Laycock	University of Alberta, Water Resources Centre
249	Werner Frenzel	Self
250	Dorothy Greenwood	County of Lac Ste. Anne No. 28 Agricultural Service Board
251	George and Rosemary Murphy (read in)	Self
252	Gwendolyn Ross (read in)	Self
253	Al Meneice (read in)	I.D. No. 17 Agricultural Development Committee
254	A.R.V. Ribeiro	Soil Conservation Society of America, Alberta Chapter
255	John Bocock	Self
256	Leonard Leskiw	Edmonton Chamber of Commerce
257	David Hughes	Self
258	Doug Laurie	Stony Plain Chamber of Commerce
259	Clarence Visser	Self
260	Dick Brenneis	Self

Supplementary Briefs

261	Christina Wager	Self
262	J. Nielsen	Heatburg Organization to Protect the Environment Society (HOPE)

263	M. Friesen	Blindman Women of Unifarm No. 9147
264	Catherine G. Burk	Self
265	R.W.H. Eben-Ebenau	Self
266	Moe LeBlanc	Lac La Biche Regional Economic Development Council
267	Virginia Young	Federation of Alberta Naturalists
268	Case Korver	I.D. No. 10 Agricultural Development Committee (Rocky Mountain House)
269	Lois Stager	Self
270	Earl H. Scott	Self
271	R. Leighton	Unifarm, Dakota Local
272	Max Vandenbrink	I.D. No. 10 Advisory Council (Rocky Mountain House)
273	Ian Rounthwaite	Environmental Law Centre of Alberta
274	C. Fred Bentley	Self
275	G. Paschen	Archaeological Society of Alberta
276	Gordon Kerr	Environment Canada, Canadian Wildlife Service

APPENDIX C. LEGISLATION ADMINISTERED BY AGRICULTURE CANADA

This material is extracted from Agriculture Canada's 1982-83 annual report (Agriculture Canada 1983).

Legislation for which the Minister of Agriculture is responsible to Parliament and for which the Minister is responsible legislatively:

Advance Payments for Crops Act
Agricultural Products Board Act
Agricultural Products Co-operative Marketing Act
Agricultural Products Marketing Act
Agricultural Stabilization Act
Animal Disease and Protection Act
Canada Dairy Products Act
Canada Grain Act
Canada Meat Import Act
Canadian Dairy Commission Act
Cheese and Cheese Factory Improvement Act
Cold Storage Act
Crop Insurance Act
Department of Agriculture Act
Experimental Farm Stations Act
Farm Credit Act
Farm Improvement Loans Act
Farm Products Marketing Agencies Act
Farm Syndicates Credit Act
Feeds Act
Fertilizers Act
Foot and Mouth Disease, Control and Extirpation Act
Fruit, Vegetables and Honey Act
Grain Futures Act
Hay and Straw Inspection Act
Humane Slaughter of Food Animals Act
Inland Water Freight Rates Act
Inspection and Sale Act
Livestock and Livestock Products Act
Livestock Feed Assistance Act
Livestock Pedigree Act
Maple Products Industry Act
Meat and Canned Foods Act
Meat Inspection Act
Pest Control Products Act
Pesticide Residue Compensation Act
Plant Quarantine Act
Prairie Farm Assistance Act
Seeds Act
Wheat Co-operative Marketing Act

Legislation for which the Minister of Agriculture shares responsibility to Parliament but retains legislative responsibility:

Canada Agricultural Products Standards Act
(Minister of Consumer and Corporate Affairs)

Legislation for which the Minister of Agriculture shares responsibility to Parliament but does not bear legislative responsibility:

Criminal Code, Section 188
(Minister of Justice and Attorney General of Canada)
Western Grain Stabilization Act
(Minister of Transport)

APPENDIX D. FEDERAL PROGRAMS AFFECTING AGRICULTURE

The following list was compiled by Agriculture Canada (W.J. Lockhart 1984 pers. comm.)

Activities complementary to the labor market
Administration
Adult Occupational Training Program
Advance payments for crops
Adverse Weather Assistance Program
Agricultural museums
Agricultural Products Board
Agricultural Stabilization Board payments
Agricultural subsidiary agreements
Agriculture for Young Canadians
Animal Pathology Program
ARDA
Atlantic Region Freight Assistance Act
Canada Grains Council
Canada Manpower Industrial Training Program
Canada Manpower Mobility Power
Canada West Foundation
Canadian Council of 4-H Clubs
Canadian Dairy Commission milk powder export subsidy deficit
Canadian Dairy Commission research, promotion, and administration
Canadian Dairy Commission's subsidy on milk
Canadian embargo on grain sales
Canadian Grain Commission
Canadian Horticultural Council
Canadian International Grain Institute
Canadian Livestock Feed Board
Canadian Plowing Council
Canadian Western Agribition
Canadian national livestock records
Canfarm
Class "A" and Class "B" fairs
Compensation to producers for crop losses caused by migratory waterfowl
Comprehensive rural economic development
Comprehensive development plan for Prince Edward Island
Consumer subsidies on fluid milk and powder
Contribution for the purpose of developing new agricultural crops and varieties for commercial production
Contribution to Canadian Wheat Board to cover charges on reserve stock to feed grains
Contribution to Canadian Co-operative Implements Limited
Contribution to Ontario greenhouse operators
Contribution to producers or processors for transportation cost of apples for apple juice
Contribution to United Co-operative of Ontario (UCO) for the construction of a grain terminal complex

Contributions for leasing railway cars
Contributions for purchase of railway cars
Contributions for the construction of new inland elevator facilities
Contributions for the expansion of feed grain storage capacity
Contributions for the construction of buildings of agricultural fairs and exhibitions
Contributions to agencies under Farm Products Marketing Agencies
Contributions to British Columbia producers for assistance because of the closure of Spetifore Frozen Foods Ltd.
Contributions to Canada Grains Council
Contributions to farmers in designated areas towards the cost of transportation of fodder and silage due to adverse weather
Contributions to Indians and Inuits for economic development and employment in agriculture
Contributions to producer groups towards the cost of construction of fruit and vegetable cold storage
Contributions to railways under Section 258 of Railway Act
Contributions to railways under Section 272 of Railway Act
Contributions to the Canadian turkey processing industry
Contributions to the Task Force on Explosions and Fire Hazards in Grain Elevators
Contributions to weanling pig producers
Crop insurance
Deficit Pool accounts
Economic growth component of Canada
Economics
Emergency Herd Maintenance Program
Expansion of total markets for agricultural products other than grains and oilseeds
Export market development
Food and Agriculture Organization (FAO)
Farm Improvement Loans Act
Farm Labor Pool
Federal Labor Intensive Program
Freight on livestock shipments to and from the Royal Agricultural Winter Fair
Grain export credit
Grains and oilseeds marketing incentives
Grants to assist research in industry
Grants to assist upgradings of technological capabilities in the food industry
Grants to farmers in designated areas who have experienced crop losses due to adverse weather
Grants to Maritime provinces towards the cost of re-establishing strawberry acreage
Grants to producers towards pregnant mare's urine (PMU)
Grassland incentive payments
Information
International Development Research Center
International Food Aid Program
International Wheat Board
Land inventory
Le Salon International de l'Agriculture et de l'Alimentation
Livestock fodder procurement

Livestock improvement
Maritime Freight Rates Act
Marketing information and assistance
Meat inspection
Membership fees and contributions to domestic and international organizations
Mennonite Central Committee Food Bank
National Farm Safety Week
Net operating loss of the Farm Credit Corporation
Payments to Canadian Wheat Board for the purchase of hopper cars
Payments to National Harbor Board for grain handling facilities at Prince Rupert
Payments to western millers (stop-off charges)
Payments to wheat producers to increase minimum return
Pesticide Residue Compensation Act
Prairie Farm Rehabilitation Administration (PFRA)
POS (Protein—Oilseed—Starch) Pilot Plant
Prairie grain advance payments
Prairie grain provisional payments
Providing employment to unemployed workers
Quality premium on high-grade hog carcasses
Quality premium on high-grade lamb carcasses
Rapeseed utilization assistance
Regional development programs
Regional development incentives
Rehabilitation of Prairie branch railway lines
Research
Royal Agricultural Winter Fair
Small farm development adjustment
Special fairs
Statistics Canada (agricultural statistics)
Summer employment and activities
Two-price wheat
Western grain stabilization
Winter and spring fairs
World Food Program

APPENDIX E. PROVINCIAL LEGISLATION AFFECTING AGRICULTURE

This list indicates which agency is charged with the administration of the Acts, but the person or department indicated is not necessarily charged with the administration of the whole Act (Public Affairs Bureau 1984).

Attorney General

- Expropriation Act
- Petty Trespass Act

Agriculture

- Agricultural Development Act
- Agricultural Pests Act
- Agricultural Service Board Act
- Agricultural Societies Act
- Agrologists Act
- Alberta Agricultural Research Trust Act
- Animal Protection Act
- Artificial Insemination of Domestic Animals Act
- Bee Act
- Beet Lien Act
- Brand Act
- Crop Liens Priorities Act
- Crop Payments Act
- Crop Payments (Irrigated Land Sales) Act
- Dairy Board Act
- Dairy Industry Act
- Department of Agriculture Act
- Farm Implement Act
- Federal-Provincial Farm Assistance Act
- Feeder Associations Guarantee Act
- Fur Farms Act
- Grain Buyers' Licensing Act
- Grain Charges Limitation Act
- Hail and Crop Insurance Act
- Harvesting Liens Act
- Horned Cattle Purchases Act
- Irrigation Act
- Irrigation Land Manager Act
- Line Fence Act
- Livery Stable Keepers Act
- Livestock Brand Inspection Act
- Livestock Diseases Act
- Livestock Injury Act
- Livestock and Livestock Products Act

Margarine Act
Marketing of Agricultural Products Act
Meat Inspection Act
Seed Control Areas Act
Seed Dealers Act
Seed Grain Purchase Act
Soil Conservation Act
Stray Animals Act
Surface Rights Act
Threshers' Lien Act
Vegetable Sales (Alberta) Act
Veterinary Surgeons Act
Weed Control Act
Wheat Board Money Trust Act

Consumer and Corporate Affairs

Agricultural Societies Act

Energy and Natural Resources

Agricultural and Recreational Land Ownership Act
Crown Cultivation Leases Act
Department of Energy and Natural Resources Act
Fisheries Act (federal legislation)
Homestead Lease Loan Act
Land Surface Conservation and Reclamation Act
Land Surveyors Act
Public Lands Act
Wildlife Act

Energy Resources Conservation Board

Coal Conservation Act
Energy Resources Conservation Act
Hydro and Electric Energy Act
Oil and Gas Conservation Act
Pipeline Act

Environment

Agricultural Chemicals Act
Alberta Environmental Research Trust Act
Clean Air Act
Clean Water Act
Coal Conservation Act
Department of the Environment Act
Drainage Districts Act

- Ground Water Development Act
- Hazardous Chemicals Act
- Land Surface Conservation and Reclamation Act
- Water Resources Act
- Water Resources Commission Act

Housing

- Alberta Housing Act

Municipal Affairs

- Agricultural Relief Advances Act
- Alberta Housing Act
- Improvement Districts Act
- Municipal Government Act
- Planning Act
- Special Areas Act

Premier

- Alberta Research Council Act

Recreation and Parks

- Provincial Parks Act

Social Services and Community Health

- Public Health Act

Transportation

- Public Highways Development Act

Treasury

- Fuel Oil Administration Act

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